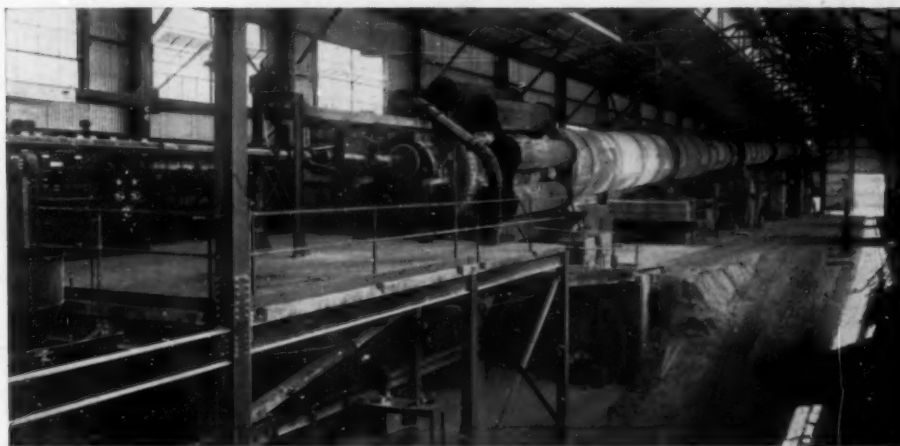


Rock Products

THE INDUSTRY'S- RECOGNIZED AUTHORITY

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The UNAX KILN for calcining lime has low fuel consumption, reduces the cost of production and delivers better quality and greater uniformity of product.

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F. L. SMIDTH & CO. are manufacturers of Rotary Kilns, Coolers, Grinding Machinery and auxiliary apparatus, and in addition are Engineer Specialists in designing and equipping plants employing such machinery.

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Engineers.

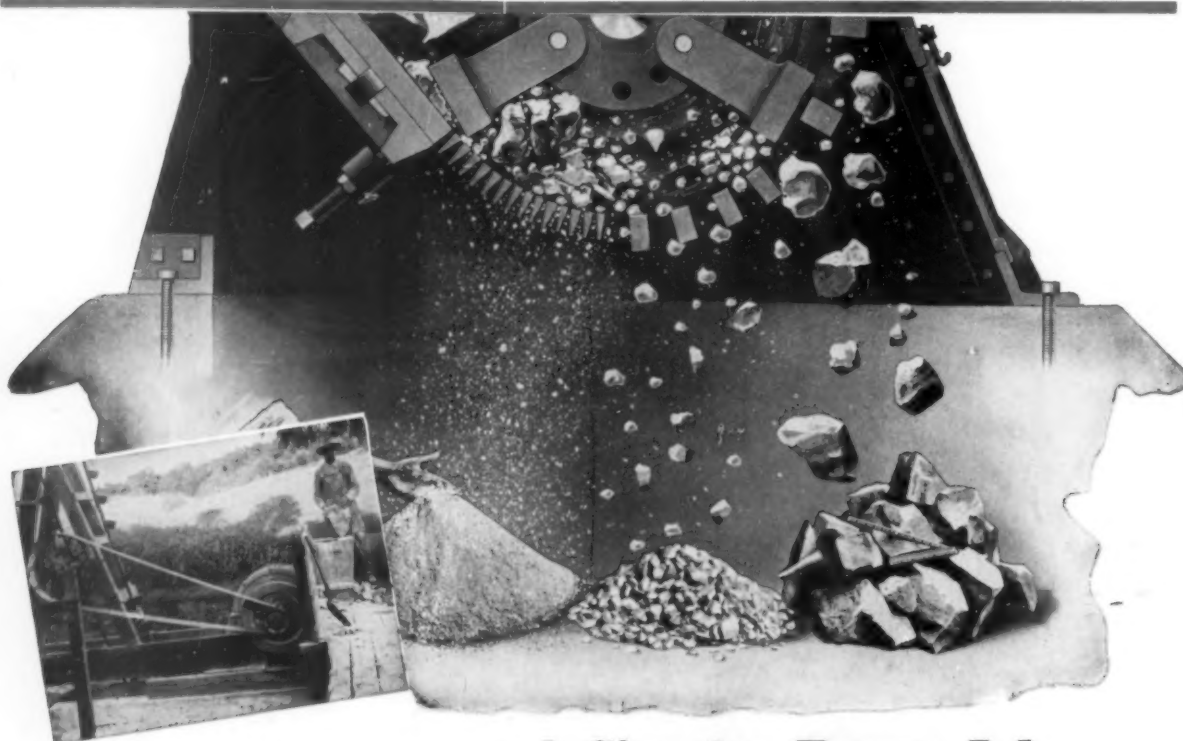
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CEMENT and **ENGINEERING CONCRETE**
NEWS PRODUCTS
Founded 1898 Est. 1918

RECOGNIZED THE WORLD OVER AS THE LEADER IN ITS FIELD

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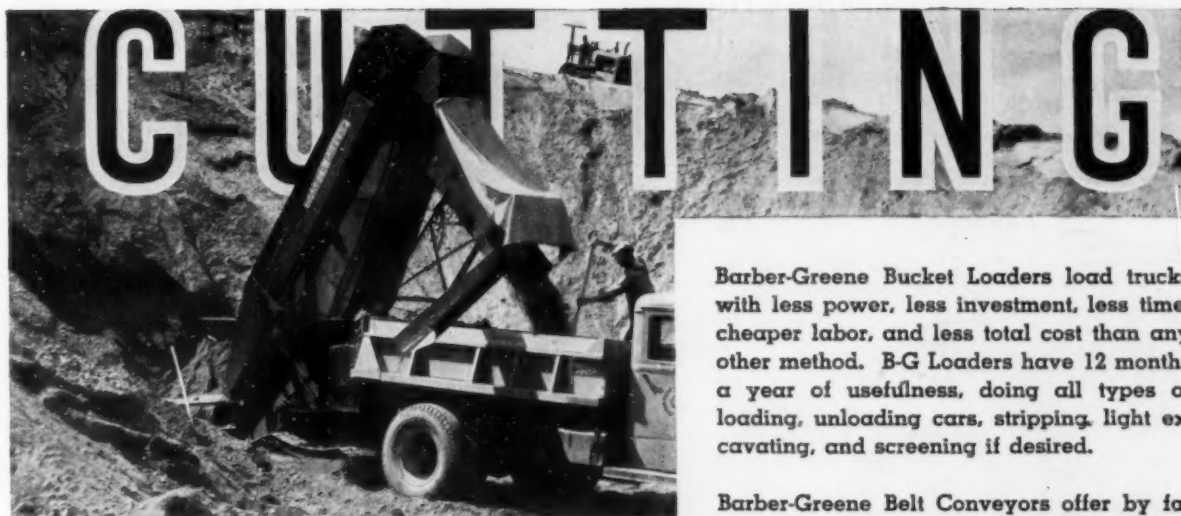
ROCK PRODUCTS
Bears the Twin Hall-Marks
of Known Value



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reader interest in terms of
paid circulation

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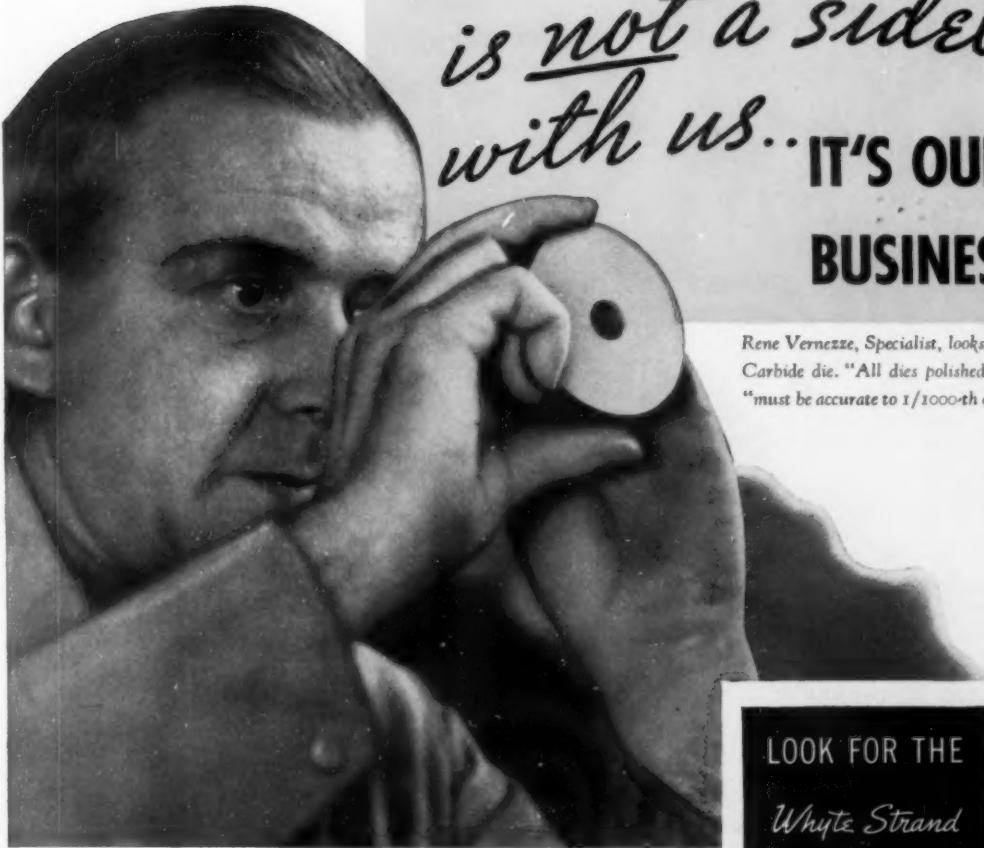


Compressor

LUBRICANTS

MAKING WIRE ROPE

*is not a sideline
with us...* **IT'S OUR MAIN
BUSINESS!**



Rene Vernezze, Specialist, looks critically at a Tungsten-Carbide die. "All dies polished at Macwhyte," he says, "must be accurate to 1/1000-th of an inch."

The Macwhyte Company has stuck to one job—specializing in the manufacture of high quality wire and wire rope.

Wire rope specialists supervise every step carefully from start to finish. On the job of polishing dies for the cold-drawing of wire, for example, specialists make sure the finished die is accurate to 1/1000-th of an inch!

The slightest variation in the diameter of a single piece of wire would cut down the service life of the rope. Macwhyte protects its users against this possibility by constant supervision of die polishing and by daily checks of dies in use.

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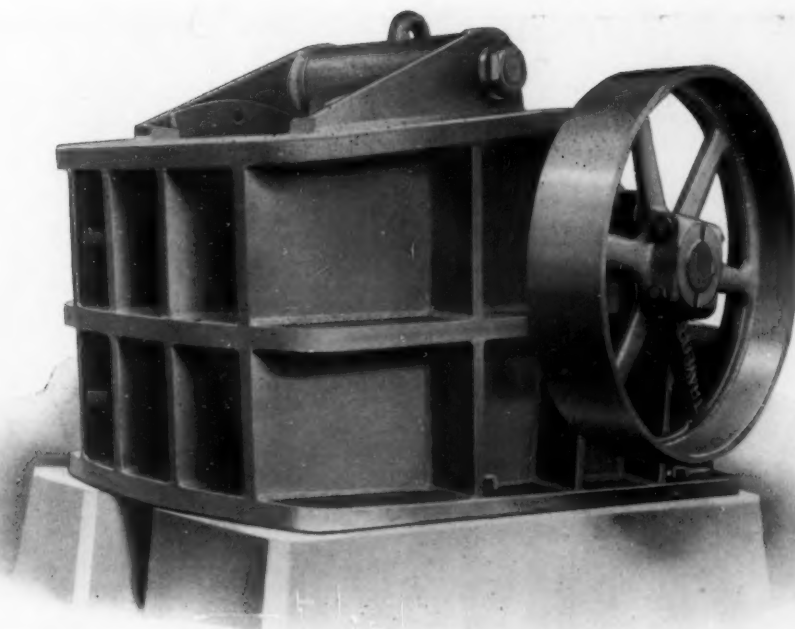
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Stacks, Tanks and Bins
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It will deliver twice as much crushed stone as ever could be secured with older designs of the Blake Type Jaw Crushers having straight jaw plates, because of the patented curved jaw plates used, which eliminate choking and packing. And that product will be smaller in size, yet the horsepower is not increased. These are not mere CLAIMS, but actual RESULTS in service.

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So, why not write us today to send our man around, or at least to ask for a copy of our new bulletin 1105?

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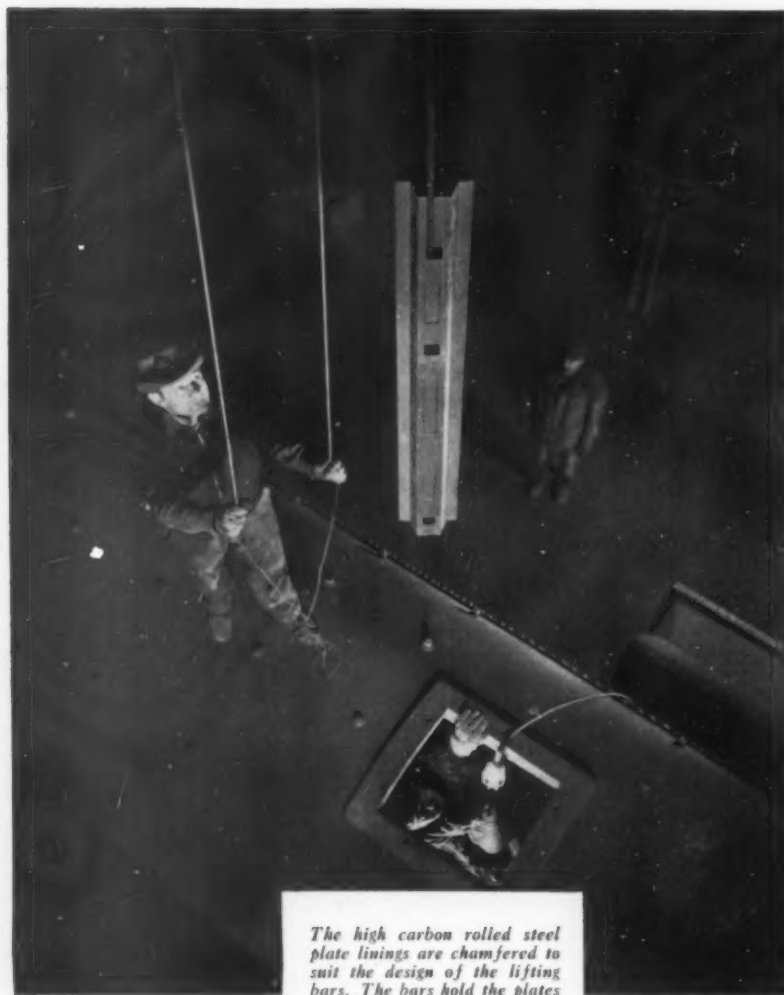
Write today for our new Specification TM-37, giving data of essential importance to present and prospective operators of ready-mix plants.

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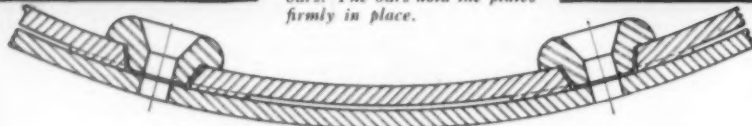


JAEGER

LIKE PUTTING A *New Blade* IN THE OLD RAZOR



The high carbon rolled steel plate linings are chamfered to suit the design of the lifting bars. The bars hold the plates firmly in place.



*Y*OUR morning shave would be pretty expensive if you had to buy a new razor every time the cutting edge became dull. Instead, you get renewed cutting action by inserting a new blade. In your grinding mills you can get renewed grinding action by using this same principle . . . by replacing only the worn part.

With older style cast linings, worn edges reduce lifting action, and the whole plate has to be changed. When you use the new U·S·S Lorain Rolled Steel Plate Lining, you can get new lifting action by reversing or renewing the lifting bars alone. The liner plate itself need not be changed, because it usually outwears the heavily punished lifting edge.

U·S·S Lorain Rolled Steel Plate Lining is made of Carnegie-Illinois Controlled High Carbon Steel. Its strength permits linings of reduced thickness and weight. Consequently the capacity of the mill for grinding purposes is proportionally increased, in both weight and volume.

Your present mills can be relined with U·S·S Lorain Rolled Steel Plate Lining. It is *easy to install*. It can be adapted to the size of the mill, type of grind, and size of grinding balls used. Our experienced engineering staff will gladly study your grinding mills and problems to make specific recommendations for the use of this long-lasting, efficient lining for your mills.

U·S·S LORAIN ROLLED STEEL PLATE LINING

CARNEGIE-ILLINOIS STEEL CORPORATION

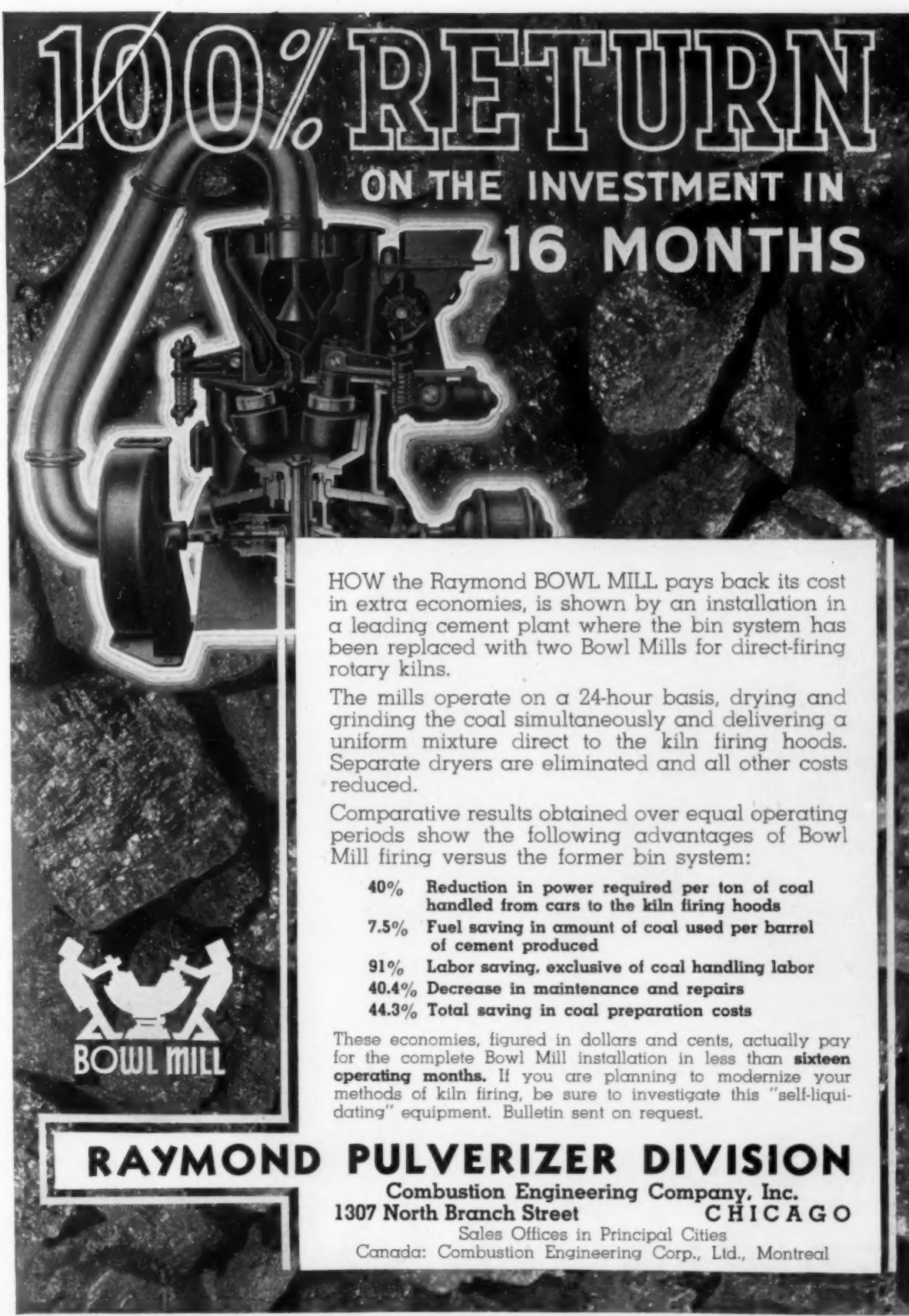
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UNITED STATES STEEL

100% RETURN ON THE INVESTMENT IN 16 MONTHS



HOW the Raymond BOWL MILL pays back its cost in extra economies, is shown by an installation in a leading cement plant where the bin system has been replaced with two Bowl Mills for direct-firing rotary kilns.

The mills operate on a 24-hour basis, drying and grinding the coal simultaneously and delivering a uniform mixture direct to the kiln firing hoods. Separate dryers are eliminated and all other costs reduced.

Comparative results obtained over equal operating periods show the following advantages of Bowl Mill firing versus the former bin system:

- 40% Reduction in power required per ton of coal handled from cars to the kiln firing hoods
- 7.5% Fuel saving in amount of coal used per barrel of cement produced
- 91% Labor saving, exclusive of coal handling labor
- 40.4% Decrease in maintenance and repairs
- 44.3% Total saving in coal preparation costs

These economies, figured in dollars and cents, actually pay for the complete Bowl Mill installation in less than **sixteen operating months**. If you are planning to modernize your methods of kiln firing, be sure to investigate this "self-liquidating" equipment. Bulletin sent on request.



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WHETHER that "pay dirt" is rock, coal, or what have you, you'll have it moving to the top faster if you leave the stripping to a Lorain. From the $\frac{3}{8}$ to 2½-yd. Lorain line, it's easy to select a shovel or dragline of a range and capacity that will fit in profitably with your particular operations.

In addition to its standard line, Lorain also offers those two famous heavy-duty shovels, the "87" and "77", fitted with special long-range stripping booms which give them exceptional height and dumping radii for piling spoil banks well back from the cut. The "87" is equipped with a 30'6" boom, 27' stick, and 1¾-yd. dipper; the "77" has a 25' boom, 25' stick, and 1¼-yd. dipper.

Built to the proved principles of Center Drive design, Lorains have the power, speed, and strength which fits them for many duties besides stripping. Shovels can be used for loading service and draglines are quickly transformed into efficient clamshells for charging bins and loading cars.

Write today for catalogs and performance data.

The THEW SHOVEL Co.
LORAIN, OHIO



"...rock goes through my TELSMITH CRUSHERS

*just like
shell corn*"

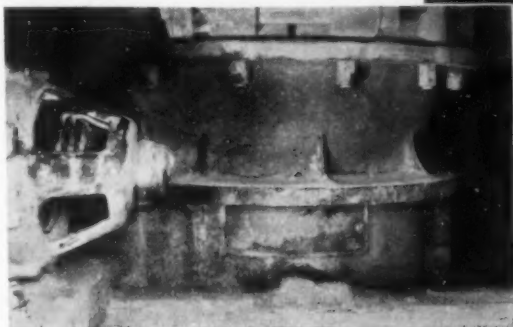


Pontiac Stone Co. plant, near Pontiac, Ill., owned and operated by A. E. Markgraf in association with his son-in-law, Leo E. Lamb. Equipped with Tel-smith Crushers, it crushes 140 — 150 tons of 97%-calcium limestone per hour.

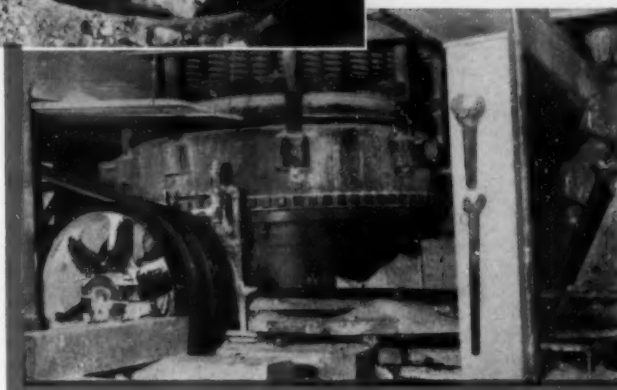


A. E. Markgraf has operated crushers for over 25 years.

He says, "the Tel-smith Breaker crushes from the time the rock gets into the concave. With other crushers it gets half-way down before they do any work to speak of."



The 16-B Tel-smith Breaker (above) is set to crush to 3-in. size. After a stationary plate screen has removed part of the fines, aggregate goes to the No. 48 Tel-smith Gyrasphere (right) for reduction to $\frac{3}{4}$ -in. size.



"The rock goes through my Tel-smith Crushers just like shell corn," says A. E. Markgraf. A quarry man for over twenty-five years, he knows his crushers. And he's had complete satisfaction with Tel-smith Crushers ever since he bought his first one, some 18 years ago.

In 1936 he bought a high-speed No. 16-B Tel-smith Primary Breaker for coarse crushing in his plant. His three trucks have been kept busy feeding it ever since . . . a 1000-ft. haul, 4 to 5 tons per truck-load . . . and as high as 26 loads in 17 minutes have been put through.

"Our demand for $\frac{3}{4}$ -in. rock became so great that we replaced two reduction crushers of another make, powered with 50 and 35-hp. motors, with a Tel-smith Gyrasphere which we powered with a 100-hp. motor, and practically doubled our capacity of small rock—yet we used less power with the Gyrasphere than with the other two," said Mr. Markgraf, "and we don't have so much slabby stuff." Why not find out for yourself why Tel-smith crushing equipment turns out a better product at the lowest cost per ton. Write for Bulletin Q-11. QC-2

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... and on TOUGH jobs
such as these, it saves
you the most money

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A G-E jobber will be glad to tell you about some of the jobs shown here, and many others, where tellurium is pointing the way to fewer shutdowns and lower-cost maintenance. Ask him on your next job.

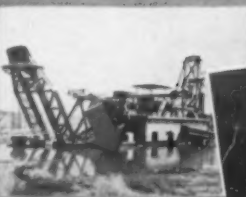
A NEW Thought on Savings

The constant increase in size of electric shovels and dredges has made the task of selecting a type of trailing cable difficult. Voltage, loading cycles, heating, regulation, protection to workmen, economics—all these factors must be taken into account.

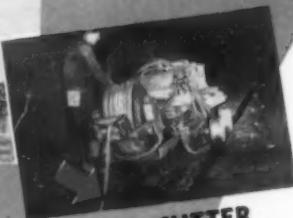
You profit most when the cable is right for each job. To this end, make full use of the services of a G-E cable specialist and get the most for your cable dollar. He can help in the selection of the right type—for long-term economy. Address nearest G-E jobber or sales office or General Electric, Dept. 6—201, Schenectady, N. Y.

**ALWAYS THE RIGHT
TYPE FOR EACH JOB**

ELECTRIC
SHOVEL



GOLD DREDGE



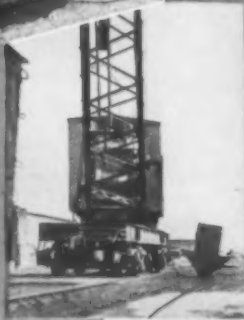
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SAND
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LOCOMOTIVE

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portable cable for
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GENERAL ELECTRIC

520-140

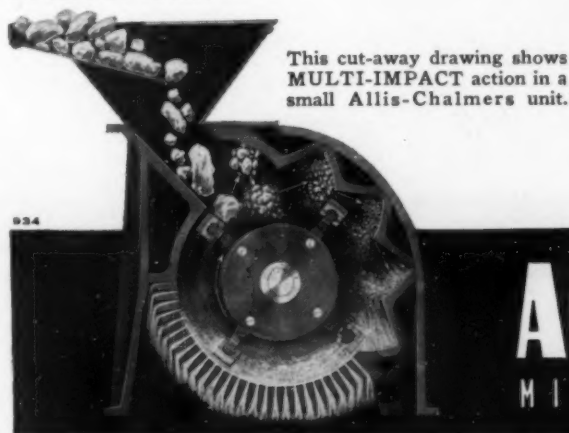
SAVE ON SERVICE COSTS WITH MULTI-IMPACT PULVERIZERS

**Allis-Chalmers Pulverizers Reduce Wear on Hammers and Grates
... Eliminate Power Waste!**

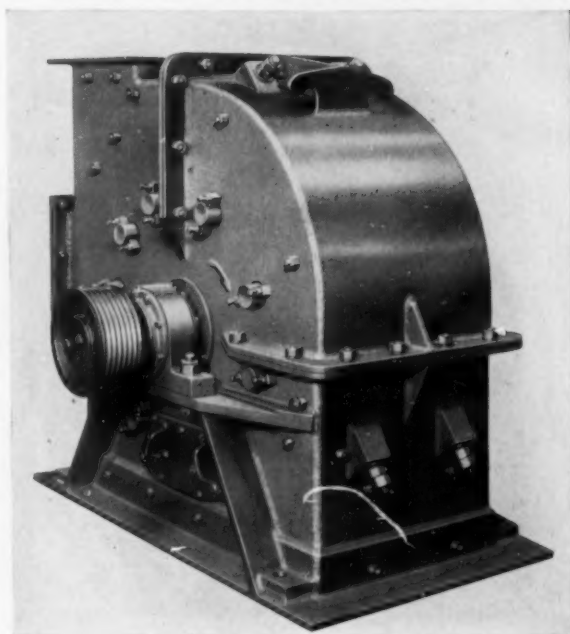
Here's how to switch from red ink to black!
Here's how to cut production costs by reducing maintenance costs . . . with Allis-Chalmers MULTI-IMPACT Pulverizers!

You can get bigger profits with Allis-Chalmers Pulverizers because service costs have been cut to a minimum. MULTI-IMPACT action reduces wear, both on hammers and on grates* . . . replacements are less frequent. Hammers are reversible, giving double wear, and detachable from the arms. And you can replace hammers without extra cost for new arms. All wearing surfaces in MULTI-IMPACT Pulverizers are protected by rugged wear-resisting liners. Large anti-friction bearings in dust-tight housings further reduce power and maintenance expense.

Find out how Allis-Chalmers MULTI-IMPACT Pulverizers can save you money by reducing service costs. Get the whole story. There's an Allis-Chalmers engineer in the district office near you who can show you how to get bigger profits . . . by saving on service costs!



This cut-away drawing shows MULTI-IMPACT action in a small Allis-Chalmers unit.



A MULTI-IMPACT Pulverizer, feed throat opening $11\frac{1}{2}$ " x 25". Pulverizers are built in seven sizes, with feed openings from $4\frac{1}{2}$ " x 9" to $11\frac{1}{2}$ " x 49".

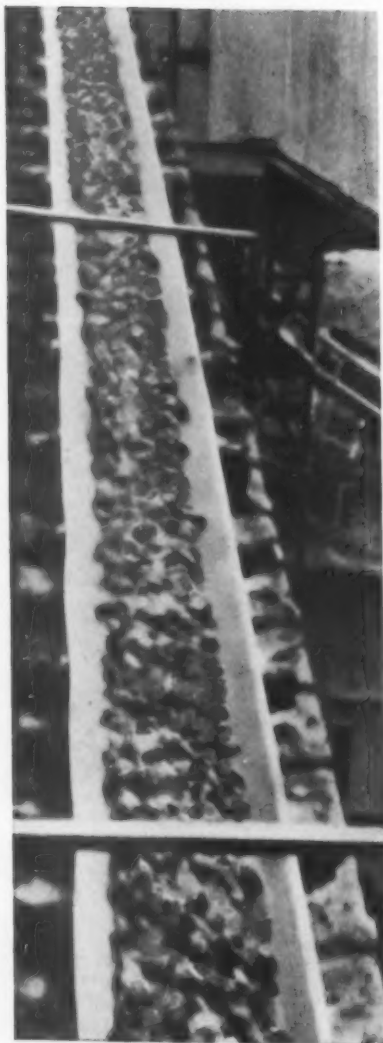
*In Allis-Chalmers MULTI-IMPACT Pulverizers, most of the work is done in the upper part of the machine. The hammers revolve upward to shatter the material to be crushed, hurling it against a series of involute breaker plates for further reduction. By the time the material reaches the bottom, most of it is fine enough to go through the grates. That's the reason *why* drag is lessened . . . *why* wear is reduced . . . *why* you can save on service costs!

CRUSHING CEMENT AND MINING DIVISION

ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

TONNAGE

Counts with Conveyor Belting



Thermoid Conveyor Belting is engineered and built with the single objective of moving more tons of material at the lowest possible cost per ton. It is tonnage that is the real measure of performance . . . the real measure of economy.

Constant research and development have made Thermoid Conveyor Belting a recognized standard in the field. The proper selection of the right belt for the right job can be just as important as the construction of the belt itself. Each type of Thermoid Conveyor Belting is specifically designed for long life on its particular type of installation.

For a new installation . . . for replacement . . . or for the solution of a conveyor belt problem, Thermoid offers facilities that are certain to lead to substantial economies.

*More than half a century of
Progressive Engineering
and Product Development*



*Standard types of belting
made by Thermoid:*

Conveyor Belting
Transmission Belting
Multiple-V Belts
Grader Belting
Conners' Belting
Bucket Elevator Belting

Thermoid

*Standard types of belting
made by Thermoid:*

Grain Elevator Belting
Agricultural Belting
Hoq Scraper Belting
Endless Thresher Belting
Oil Country Belting
Axle Fighting Belting

THERMOID RUBBER, DIVISION OF THERMOID COMPANY, TRENTON, N. J.

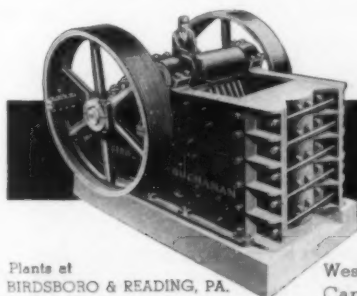
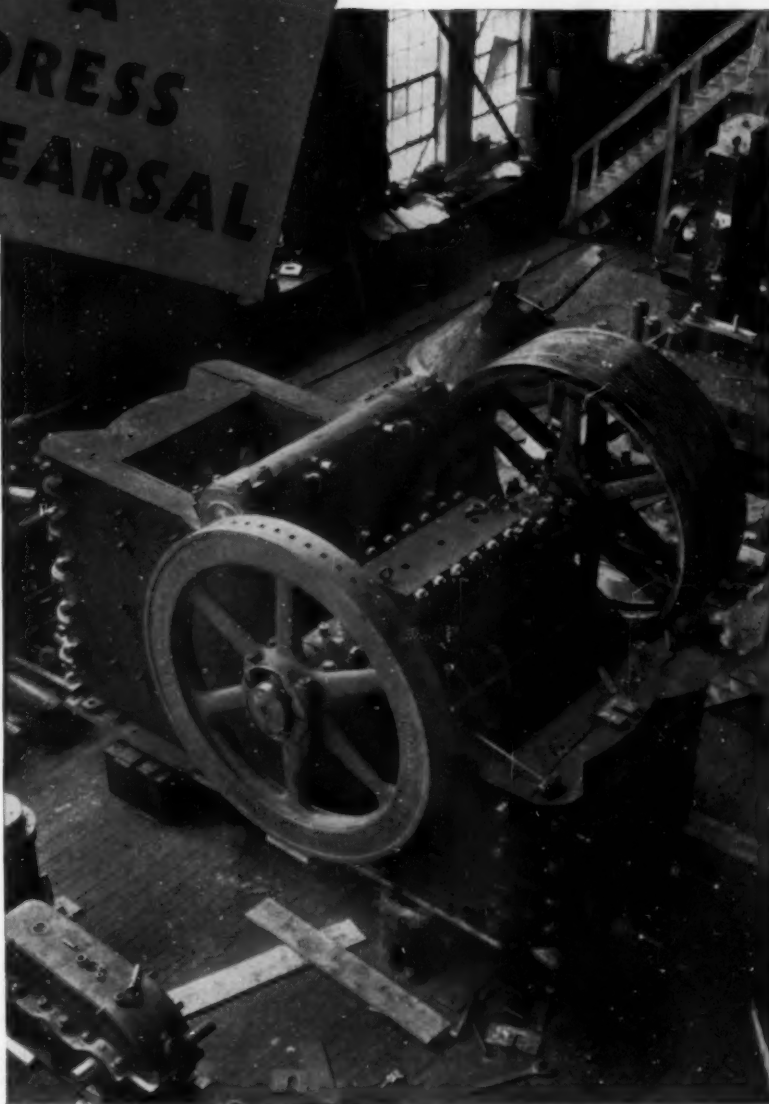
Back of Every Good Performance

A DRESS REHEARSAL

In remote or inaccessible locations and in foreign countries, trouble-free crusher performance is of first importance. Failures can hold up production for days. That's why Birdsboro-Buchanan Crushers are "dress rehearsed" for the job they have to do in your plant. Here's what happens.

At the furnaces the steel is held within close chemical analysis limits and poured under pyrometer control. Castings are all made by the Randupson Process of Precision Casting. In the shop, fitted surfaces are machined to dust-close tolerances; bearings line-machined. Then comes the dress rehearsal. Before shipping, each part is assembled and all auxiliary equipment attached for a running test. Action, alignment, lubrication and developed-crushing strength are checked against requirements. In the field, this careful manufacturing control and final check pays dividends in trouble-free performance.

For instance, after more than 30 years, the first Birdsboro-Buchanan Crusher is still in operation. In bulletin 110, you will find details of other construction features that make such an outstanding performance record possible. Send for it today.



Plants at
BIRDSBORO & READING, PA.

BIRDSBORO - BUCHANAN

A Division of: BIRDSBORO STEEL FOUNDRY AND MACHINE CO.


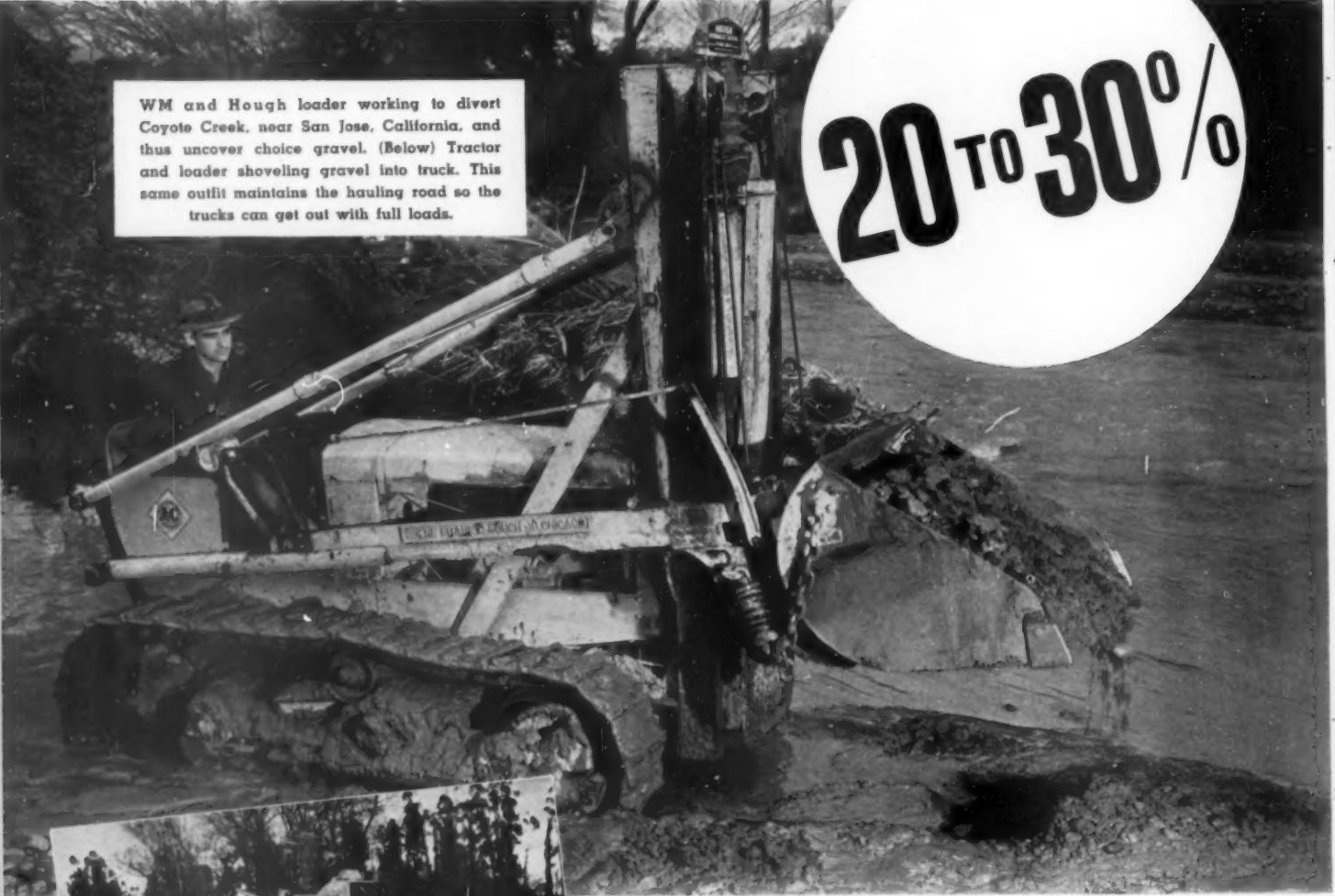
Sales Office: 90 WEST STREET, NEW YORK CITY, U. S. A.

Western Representative: Mine and Smelter Supply Company, Denver • Salt Lake City • El Paso
Canadian Representative: Fraser and Chalmers, Ltd., G. E. Sancton, Mgr., Montreal, Canada

SPEEDS UP LOADING OPERATIONS

WM and Hough loader working to divert Coyote Creek, near San Jose, California, and thus uncover choice gravel. (Below) Tractor and loader shoveling gravel into truck. This same outfit maintains the hauling road so the trucks can get out with full loads.

20^{TO}30⁰%



That's what E. H. Cunningham, West Coast owner, says of his Model WM tractor and Hough loader, shown here. This outfit built a road into the job, dug a new channel to divert a creek from choice gravel deposits, then shoveled the gravel into trucks for hauling. In 800 hours of operation neither tractor nor loader have been laid up for repairs, never lost a day's work. Like Cunningham, you can cut your loading costs with a WM tractor and Hough loader . . . in addition build and maintain your hauling ramps and roads, do light stripping, stockpile material, etc. Can be easily and quickly towed from one gravel pit to another on its own transport wheels. Drawbar is always free for pulling. Ask your nearest Allis-Chalmers dealer to show you how this fast-moving outfit can cut your aggregate costs.

Gasoline and Controlled Ignition Oil Track-Type Tractors from 32 to 80 Drawbar H. P. . . Tandem and Single Drive Speed Patrols . . . Drawn Blade Graders . . . Industrial Wheel Tractors . . . Stationary Power Units from 31 to 102 Brake H.P. . . two, four and six-wheel scrapers, bulldozers, trailbuilders, loaders, winches and other allied equipment.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

7 Ways to Grind Your Material

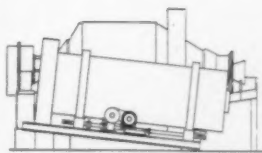
Grinding in Open Circuit

For grinding ores, silica, clay, coal, abrasives, and the like, where extremely fine sizes are not needed, Open Circuit Grinding in the Hardinge Conical Mill is highly satisfactory. The classifying action of the cones automatically sizes the product. This is the only mill capable of accomplishing this result without the use of screens or outside classifiers. Operation—wet or dry. Feeds as coarse as 2" and products range from 10 mesh to approximately 50 mesh economically. Capacity ranges from a few pounds per hour to fifty tons per hour, depending on the size mill used. The "Pebble Mill" is used where the product must not be contaminated with iron.



Closed Circuit Wet Grinding With Classifier

The Hardinge Conical Mill when operated in closed circuit with the Hardinge Counter-Current Classifier, delivers a uniformly fine product when grinding wet. The Mill product flows by gravity to the classifier, where the particles that are insufficiently ground are separated from the finished product and delivered at one end and returned also by gravity to the Mill for regrinding. Control of the fineness of the classifier overflow is accurate, and products as coarse as 20 mesh or finer than 325 mesh are obtainable in very large or small capacities and for hard or soft materials.



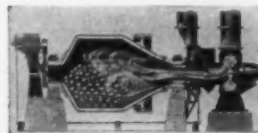
Conical Rod Mill for Granular Products

The Hardinge Conical Ended Rod Mill uses rods instead of balls in the grinding compartment. When rods are used a granular product is secured at high capacities with low power consumption. Grinding may be accomplished wet or dry. The conical ends keep the rods always in alignment and afford room both at the feed and discharge end for the material to seek its own level. In some cases peripheral discharge ports are used to improve the granular characteristics of the product. Feed size should not exceed 3/4" unless the material is very friable. Products range from 4 mesh down to 30 mesh. Also especially suitable for damp material as there is little tendency to pack, as a mixer or coater for lime with sand in sand lime brick manufacture, and as a beater for wood chips.



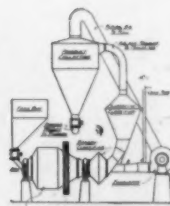
Unit Coal Pulverizer

For grinding and direct firing of coal or pyrites, the Hardinge Unit Pulverizer has the distinct advantage that no independent Dryer is needed when damp coal is used. The unit also has an unusually low maintenance cost. The reverse current system of air classification is employed to insure uniform fineness under all conditions and an automatic level control is employed when instantaneous changes in capacity at the burner are needed. This is the only mill on the market that has this feature.



Closed Circuit Grinding With Air Classifier

A combination of the Hardinge Mill and Reversed Current Air Classifier is ideal for producing fine dry products. The Cones in the mill make a primary classification, while the air classifier makes the final classification and automatically returns the oversize back to the mill for regrinding by the principle of reverse currents. No material passes through the fan, which eliminates wear, particularly when handling abrasive materials. When damp material is encountered, the Hardinge Air Heater is recommended to operate in conjunction with the mill. The additional cost is but a portion of that required where a separate drying unit is used. The feed may be as coarse as 2" and final product from the classifier, from 50 mesh to 325 mesh as desired.



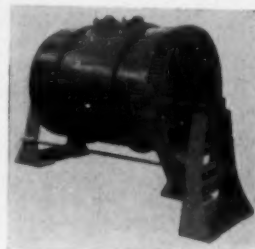
Fine Grinding With Tube Mills

To secure a fine product without the use of Classifiers, the long tube mill is recommended. Its operation is "single pass" or "open circuit" unless the case is special. Grinding may be accomplished either wet or dry, using balls of flint pebbles as the grinding media. The feed size should not exceed four mesh, and if possible finer. The product depends upon the rate fed. The progress through the mill is primarily by displacement, hence may be of any desired fineness from about the same as the feed size to all through 325 mesh or finer. Certain characteristics of the product not obtained in other types of mills are possible with the tube mill.



Batch Mill Grinding

Where relatively small quantities of material are to be ground, or specifications are very severe, the Batch Mill is recommended. Balls or Pebbles are used as in the continuous mills, but the mill is charged in batches, run a predetermined length of time, then discharged. It is especially successful in grinding such materials as clays, pigments, colors, ink, ceramics and the like. Capacities range from a few pounds or gallons to 8000 pounds or 1600 gallons per batch.



HARDINGE COMPANY INCORPORATED

YORK, PENNSYLVANIA, Main Office and Works

NEW YORK, 122 E. 42nd St. CHICAGO, 205 W. Wacker Drive SAN FRANCISCO, 501 Howard St. DENVER, 817 17th St.

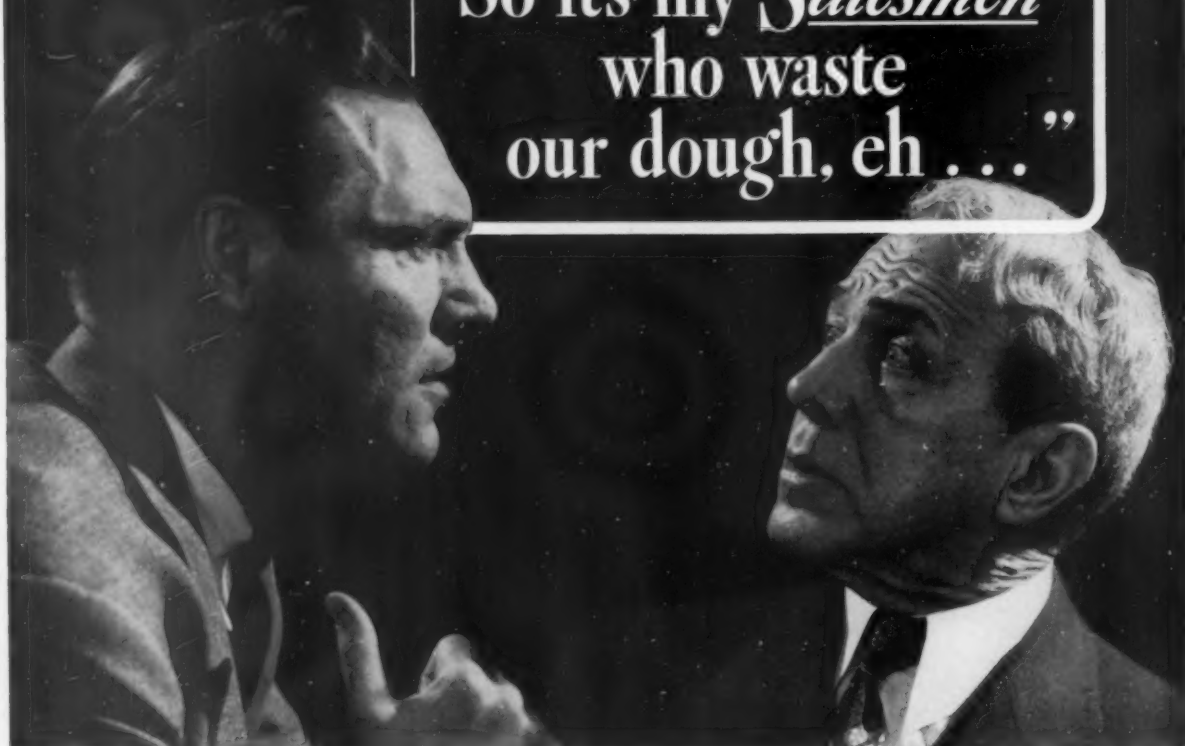
Also Ruggles-Coles Dryers, Thickeners, Feeders, Classifiers, Kilns, Coolers, Scrubbers, Sludge Pumps

JULY, 1938

21

(A MONOLOGUE THAT ADVERTISERS WOULD DO WELL TO OVERHEAR)

"So it's my *Salesmen*
who waste
our dough, eh . . ."



*roared the Sales Manager
to the Treasurer . . .*

●● think our salesmen's 'swindle sheets' are too high, do you? Claim they should spend money only on prime prospects, hey? Well then, why don't we do the same with our advertising appropriation?

"You tell me that every cigar a salesman hands out these days should bring in an order, and I'm telling you that more of our advertising money should be concentrated in the rock products and concrete products field . . . to cultivate the men our salesmen have to sell. For instance, let's make sure

we're doing an impressive job in ROCK PRODUCTS, the publication that our prospects look to for progressive ideas and dependable news. That'll give us what we need *right now*: selling help *where it counts*, at less cost than a cheap cigar per prospect.

"If you'll switch a bigger chunk of our advertising budget to ROCK PRODUCTS, I'll confine my sales expense to our hot prospects.



●●
"Okay, wild man,"
said Treasurer MacTavish,
"it's a deal!"

Highest editorial
standards and pub-
lishing integrity.



ROCK PRODUCTS

◆ bears the twin hall-marks of known value ◆



Proved reader in-
terest in terms of
paid circulation.

FORD PRESENTS CAB-OVER-ENGINE DESIGN *to the* *Low-priced Truck Field*



FEATURES OF THE FORD V-8 CAB-OVER- ENGINE TRUCK

FOR YEARS truck owners and operators have asked for a low-priced cab-over-engine unit. Ford now answers this demand. The Ford V-8 Cab-Over-Engine is here.

The Ford V-8 Cab-Over-Engine is of advanced design, yet it utilizes time-and-service-proved features of Ford construction. Every detail has been planned to take the greatest advantage of a short wheelbase to provide increased payload space.

But most important of all features to be found in these new units is Ford Economy. Owners and operators everywhere report that the Ford Truck does more work, in less time, at lower cost. The reason—because Ford has found the way to make extra cylinders mean extra economy as well as finer performance.

Examine the Ford V-8 Cab-Over-Engine Truck at your Ford dealer's today. Then arrange for an "on-the-job" test with your own driver and your own loads over your own routes. No cost.

- ★ 101-inch and 134-inch wheelbases.
- ★ 85-horsepower eight-cylinder engine.
- ★ Advanced design. Service-proved top-quality Ford engineering features.
- ★ Easy entrance to cab, wide door hinged at front.
- ★ Comfortable riding.
- ★ Easy steering.
- ★ Easy accessibility to engine.
- ★ Designed for convenient servicing.
- ★ Greater maneuverability in traffic.
- ★ Greatly increased payload space.
- ★ Increased view of road.
- ★ Decreased turning radius.
- ★ Time-and-money-saving Ford Engine and Parts Exchange Plan.

FORD V-8 TRUCKS

MORE WORK IN LESS TIME AT LOWER COST ACCORDING TO OWNERS' RECORDS

KOEHRING TRAIL-DUMP



EASY LOADING

—Low, wide body of the Koehring Trail-dump allows quick and easy loading, from a shovel dipper, dragline bucket or elevating grader. Three point suspension and free motion of swiveling hitch yoke permits travel through ditches, over furrows and up and down steep dump grades, with full traction of all wheels.



KOEHRING COMPANY

Pavers - Mixers - Shovels - Cranes - Draglines - Dumpers - Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

.Rock Products

Vol. 41

Chicago, July, 1938

No. 7

Labor Relations Begin At Home

PEOPLE who work for wages are referred to as "labor." Handling such people *en masse* is called industrial or labor relations. The problem of achieving amicable labor relations was not discussed much until these people awoke, or were made class conscious, to the fact that because of their numbers, in a democracy, they had immense power through political control of things.

Labor gets its opinion of employers *en masse* from (1) personal individual experiences; (2) from what it hears or reads. While any group may be greatly swayed and moved to action by impressions from written or spoken words, it is common sense based largely on personal experience that in the end provides wisdom to select the right course, or to return to it after having strayed. The individual experiences of some labor do not jibe with what it reads and hears; the individual experiences of some labor unfortunately do jibe with what it reads and hears. That means trouble, not only for the employer of this group but for all employers and for society.

Labor proposes to use its political control of things for what it thinks are its own best interests. And who does the thinking for labor? During the periods of violent emotion and rapid action, the thinking is done by those who speak and write for labor consumption—so-called labor leaders or labor agitators, or politicians operating under a political party label. In periods of soberness, when any progress made is consolidated, labor, just as any other group in society, does its own thinking from personal, individual experiences.

The average employer has small chance of competing with politicians in influencing labor through mob psychology. So, while a great deal of pollyanna talk by leading industrialists urging happier labor relations, etc., is helpful as an educational process, it does not meet specific situations; and specific situations constitute the crux of labor problems in which the ordinary employer is interested—and *in toto*, national labor relations.

The weakness of the politician's handling of labor relations is his assumption that labor is ignorant and gullible. Another is that the average politician has only one interest to serve, and that is to stay on the public payroll. Eventually labor becomes aware of these weaknesses; and Lincoln's proverb that "you can fool some of the people all the time, all the people some of the time, but never all the people all the time," is proved again.

The strength of the employer's position is that he deals with labor as individuals and he knows that all labor is neither ignorant nor gullible; and as individuals nearly all men and women are susceptible to fair and honest

and honorable treatment. Also, the strength of the employer's position is that his interests and those of his employees are the same. It is his individual responsibility to see that his employees realize this. It can not be accomplished by employers *en masse* hiring speakers to harangue their employees, or by harangues by men of big business to other men of big business. It cannot be accomplished by an employer haranguing his employees himself—for "actions speak louder than words."

It was not intended to imply in the editorial on labor relations in the May issue of ROCK PRODUCTS that employers generally in this industry need education in handling their own employees. It was attempted to emphasize in language that plant men could readily understand that labor relations are not any more a national problem than the employer's own problem, and that national labor relations will be healthful only if and when *each and every* individual employer accepts responsibility for dealing with his own employees on a straight-forward, man-to-man basis.

Even now the possibility lies within the grasp of American industry to effectively counteract political exploitation of labor by proving to labor in each individual business enterprise that it does not have to appeal to politicians and political boards to get fair treatment and consideration as human beings. That may sound trite, but nevertheless let us continue to emphasize that it is the *only* feasible solution of the national labor relations problem, which will save both American employers and employees from being so fettered by laws, rules and regulations that we shall no longer be able to recognize what we have always believed were the fundamental principles of American democracy.

In this country the majority is the government—not office holders, or so-called public servants; for these can be changed at the whim of the majority. Therefore, when we put our labor relations, economic and political problems up to the government to solve, we are in fact putting them up to the majority of the voting population to solve. The majority in small groups can learn from individual experiences with individual employers some of the fundamentals of successful business management and of the economics of business or industry; and in the end native common sense will triumph over political cajoling.

Nathan C. Rockwood

Produce Large Variety of Aggregates and Recover Dust In

100% GRAVITY-OPERATED PLANT

By BROR NORDBERG

AFTER 12 YEARS' EXPERIENCE in producing sand and gravel at Middletown, Ohio, Russell D. Stevens, president of the Middletown Sand and Gravel Co., has built an ideal plant that is designed to simplify the production of aggregates and to eliminate weaknesses in operating methods as observed in his old plant.

The plant is small, with an hourly capacity of 60 tons of washed material, but it has a number of interesting features seldom seen in an aggregate plant. Excavation is by slackline cableway to the top of a crushing and screen house of galvanized iron and steel construction, super-imposed on concrete storage bins. The plant is 100 percent gravity-operated, none of the material being elevated by bucket elevator, belt conveyor or other means. Arrangement of equipment is very compact and the plant is flexible in operation, having two crushers, a jaw crusher for over-size and a roll crusher for reduction to smaller sizings as needed.

Heating Aggregate Plant

In connection with the sand and gravel plant a ready-mixed concrete plant was built, with a low steam pressure Kewanee boiler installed to heat aggregates in the bin batchers as well as to furnish heat for the sand and gravel plant. The sand and gravel plant is entirely sealed so that operations can continue in zero temperatures, if necessary, with the maximum in comfort for the workmen.

In the screening plant is a large capacity 3-unit Trane hot air heater of the type commonly used for heating purposes in industrial plants and fac-



Screening plant is sealed and heated in the winter months with hot air from the heater shown above. In the foreground is shown a sand tank for making mason's natural sand and in the background is another tank for recovering gravel dust

tories. Below the storage bins in the truck runway is a single heating unit which is operated mainly to keep the bin gates from freezing. The runway has large, tight-fitting drop doors which are closed when the heat is turned on. Another interesting feature is that in

addition to masons' and concrete sand, the stone dust product of crushing is recovered in a commercial sand settling tank and sold for topping driveways or for sand, if so desired. All material handled is a salable product and nothing is wasted.

The deposit under excavation has an overburden of about 18 in., which is stripped and contains considerable plus $\frac{1}{2}$ -in. gravel and about 30 percent minus $\frac{1}{4}$ -in. gravel and sand. Material is delivered into a 25-cu. yd. hopper over a scalping screen by slackline cableway in conjunction with a 90-ft. Page fabricated steel mast.

The 1-cu. yd. Sauerman bucket has been built up to $1\frac{1}{4}$ -cu. yd. capacity and has an extra heavy lip and double thickness of bottom, representing from 1000 to 1500 lb. added weight. This, of course, facilitates running the bucket back into the pit, which is being excavated to 50 ft. below the water surface, and is used to advantage when heavy digging is encountered. The bucket is handled by a Thomas 2-speed, 2-drum hoist driven by a 100-hp. motor. The deposit contains no clay and the only foreign matter, soil, is readily washed out over the screens.

Over the hopper which feeds material to the scalping screen is a stationary grizzly made up of railroad rails spaced 7-in. apart. The little plus 7-in. material slides off the grizzly bars to the ground. From the hopper, material is fed evenly over the scalping screen by



Left: Gravel "dust" being flumed from the crushed gravel sizing screen to a sand settling tank. Right: Concrete sand is produced in the sand tank in the background and the overflow enters the left tank where mason's sand is produced

a double-arm, oscillating feeder, driven by a 3-hp. motor.

The scalping screen, a 3-x6-ft. double-deck Productive Equipment Corp., "Selectro" vibrating screen, has 1½-in. sq. openings on the top deck and ⅝-in. sq. openings on the bottom deck. In addition to scalping off plus 1½-in. gravel for later reduction through a crusher, as much sand as possible is taken out, through the ⅝-in. openings immediately for passage through the natural sand recovery equipment and ⅝- to 1½-in. gravel flows directly to the vibrating screen for sizing uncrushed gravel. Wash water is applied on the scalping screen, which is driven by a 3-hp. motor.

The 3-x8-ft. three-deck sizing screen for uncrushed gravel, also "Selectro" manufactured by the Productive Equipment Corp., has ¾- or 1-in. sq. openings on the top deck, ⅝-in. sq. openings on the intermediate deck and ¼-in. round openings on the bottom deck, and functions the same as a 4-deck screen,



General view of aggregates and ready-mixed concrete plants. Note upper half of insulated water tank in center, and the drop doors in the sand and gravel plant which facilitate heating the bin gates during cold weather

of mortar sand (⅝-in. top size). Both of these products are uncrushed sand, going directly into bins below. The overflow (waste) from the second tank and

3-x6-ft. double-deck "Selectro" vibrating screen with ¾-in. and ⅝-in. sq. openings on the top and bottom decks, respectively, where it is washed. The ⅝-¾-in. crushed gravel goes to a bin. Minus ⅝-in. dust is flumed to a No. 5 Eagle settling tank where it is recovered and sold either for sand or for miscellaneous topping purposes. From 5 to 6 cu. yd. of "gravel dust" is recovered daily with normal setting of the jaw crusher.

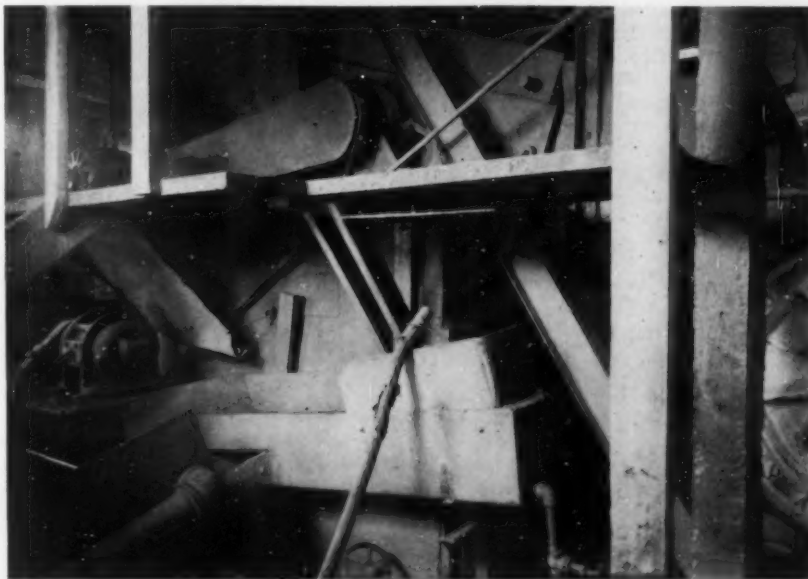
The ¾-1½-in. product either enters a bin as a finished product or is put through a New Holland 16-x16-in. double-roll crusher driven by a 30-hp. motor for further reduction. The output of this crusher, usually a ½-in. minus product, is passed over a 3-x6-ft. single-deck vibrating screen. The cloth on this screen is varied and the over-size is scalped off into the ballast bin. The throughs are chuted to a bin where they are mixed with the sized crushed product from the jaw crusher.

The plant has unusual flexibility in its ability to produce a number of gradations of material and in the regulation of the amount of any one product. For example, pea gravel can be crushed to produce more stone dust. In making Ohio No. 46 road material, the ¼-¾-in. uncrushed gravel from the triple-deck sizing screen may be put through the roll crusher over a short Wisconsin Foundry 14-in. belt conveyor or be put in the proper bin direct through a split throat in the chute, to add desired rounds.

This specification requires that 40 percent of the gravel be crushed, with the following gradation:

100 percent	minus 1-in.
95-100 percent	minus ¾-in.
65-90 percent	minus ⅝-in.
35-65 percent	minus ⅜-in.
0 percent	minus ¼-in.

The gradings produced are mortar sand, concrete sand, dust, No. 46 road



Oversize from the scalping screen above goes to the crusher on the right and sand moves to a flume below. Note steel flume to carry sized gravel to the vibrating screen, lower left, for further separation

since the scalping screen removed the extremes in sizes. Gravel is washed over this screen also, and it is driven by a 7-hp. motor.

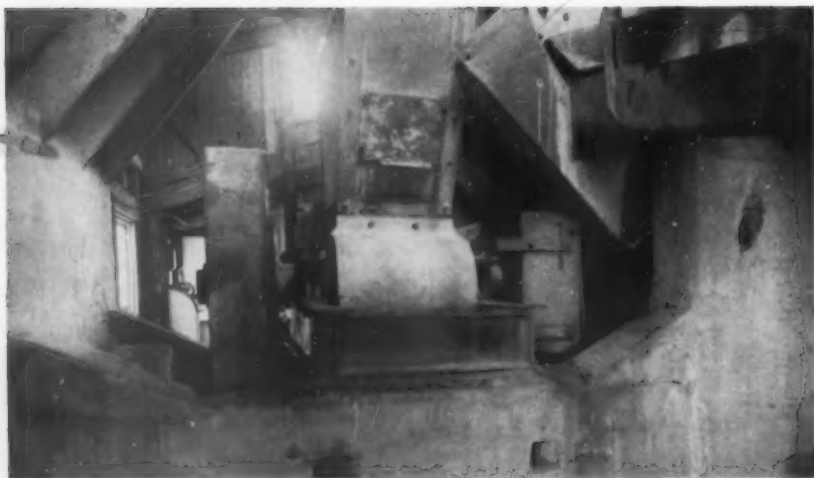
Mason's and Concrete Sand

Minus ¼-in. sand from the sizing screen joins that passing the ⅝-in. openings on the scalping screen in a common steel flume and enters the first of two No. 6 Telsmith automatic sand settling tanks. The weights on this tank are adjusted for the recovery of concrete sand and the overflow enters a second similar tank set for the recovery

that coming from other parts of the plant enter a 12-in. vertical pipe and discharge to a sewer below.

As was mentioned earlier, at the scalping screen a division is made between material to be crushed and the natural gravel and sand. All gravel retained on the top deck of the scalping screen (plus 1½-in.) drops directly into a Badger (Wisconsin Foundry and Machine Co.) 9-x36-in. roller bearing jaw crusher, set to reduce all gravel to minus 1½-in. This crusher is driven by a 50-hp. motor through a flat belt drive.

The crusher discharge flows over a



Double-roll crusher through which gravel is passed in making certain aggregate specifications

material, $\frac{3}{8}$ - $\frac{3}{4}$ -in. gravel, $\frac{1}{4}$ - $\frac{3}{8}$ -in. gravel, $\frac{3}{4}$ -1 $\frac{1}{2}$ -in. uncrushed gravel (bypassing the jaw crusher), $\frac{1}{8}$ - $\frac{3}{4}$ -in. crushed gravel and $\frac{3}{4}$ - to 1 $\frac{1}{2}$ -in. crushed gravel. The demand for crushed gravel is continually on the increase, according to Mr. Stevens. The plant has 500-cu. yd. storage in 12 concrete bins and wash water is furnished by a 5-in. and a 6-in. centrifugal pump with a combined capacity of 1500 g.p.m. The pumps are each driven by a 25-hp. motor.

Heating Batched Aggregates

As was mentioned earlier, the aggregate plant is equipped for year-around operation and also to insure a supply of material in winter as well as summer for the ready-mixed concrete plant. The materials for ready-mixed concrete are generally taken from stockpile and loaded into a 33-cu. yd., 2-compartment Blaw-Knox batching bin by a $\frac{3}{4}$ -cu. yd. Northwest clam.

Aggregates are heated in the bin to about 70 deg. in the cold months by introducing live steam into the bottom of the bin through 1 $\frac{1}{4}$ -in. perforated pipe. Water is heated by steam coils in a 15,000-gal. steel tank to about 200 deg. F., in the winter months. The tank is insulated with a 6-in. thickness of sawdust between the steel tank and a wood outside shell. All pipe are insulated with tar and three layers of heavy tar paper. Water is introduced into the tank through a valve on the regular pump line and a hand valve releases heated water into the truck mixers while they are receiving cement from the warehouse. This is done after aggregates have first been placed in the mixers. In extreme cold temperatures, heated water can be diverted for priming the pumps. Steam is developed to 4 or 5 p.s.i. pressure in the steam boiler,

which requires a car of coal for a season's run.

In addition to the batching plant just described, three bins in the aggregate plant are provided for the batching of concrete, where hot air heat may be constantly applied. The practice of being equipped to deliver concrete in all seasons has been effective in getting more business, much concrete being used locally for inside construction where the producer's responsibility rests in delivering concrete at the proper temperatures. Deliveries are made in

1 $\frac{1}{2}$ -cu. yd. Jaeger truck mixers on Ford trucks. The plant is designed for trucking of aggregates, from bins, or by direct loading from stockpile with a $\frac{3}{4}$ -cu. yd. Northwest shovel.

Russell D. Stevens, Jr., is vice-president and superintendent and Lorene Stevens is secretary and treasurer.

BARITE MINING in the United States was unimportant prior to the World War, but with the cessation of imports during the war the manufacturers of lithopone and barium chemicals forced the development of domestic barite deposits. Due to the increasing demand for lithopone (white pigment mixture of approximately 70 percent barium sulphate and 30 percent zinc sulphide) by the paint, floor-covering and rubber industries, development of domestic deposits has expanded, states a report of Bureau of Mines, Investigations 3376. In 1914, the sales of domestic crude barite amounted to 52,919 tons, and in 1935 this figure had increased to 225,111 tons. Although important barite deposits occur in at least 20 states, only those in California, Georgia, Missouri, Nevada, South Carolina, Tennessee, and Virginia reported sales of barite in 1935. The Bureau of Mines in coöperation with the University of Alabama has made an investigation of the amenability of southern barite ores to table concentration and froth flotation, the results of which are now available.



Above: Loading aggregates from stockpile into trucks by gasoline shovel. Below: Batching bins where aggregates are placed in transit mixers. These bins are heated by live steam for winter operation

Mutual Responsibilities and Interests of the LIME AND FERTILIZER INDUSTRIES

By MYRON S. HAZEN*

Service Division, American Agricultural Chemical Co.

FROM THE STANDPOINT of our respective industries and their ability to better serve the farmer, who is in both cases our ultimate customer, important and highly significant changes have taken place in the past ten years. Without any attempt to enumerate all of these changes I do want to mention three of special importance.

First, and probably most important is the development, standardization and general acceptance of the so-called pH scale. Twenty-five years ago we started to make our first crude soil tests, and some of you will remember going into the field with strips of litmus paper, carefully selecting a moist handful of soil, fracturing it in the center, and then pressing the litmus paper between the two portions. If the paper turned red we told the farmer to use lime and plenty of it. If by some strange chance it showed blue we told him with equal definiteness that he did not need any lime.

While it was customary to take a number of samples from different portions in the field, relatively few workers ever prepared a composite sample; and these crude tests, instead of representing the field as a whole, usually represented a few isolated spots where the samples were secured.

With the coming of the pH test and its improvement both through the electrolytic and colorimetric methods we are now in a position to tell the farmer not only whether his soil is sour or sweet, but to give him specific information with respect to the amount of neutralizing material which he requires for any given crop.

Thirty years ago it took an expert chemist a full week to make something in the nature of a complete soil analysis. No attempt was made to differentiate between the total and the available plant foods, and some of the early analysis reports were fantastic in the amount of plant food disclosed.

By the method of trial and error, a lot of hard work and a great deal of constructive thinking, there has gradually been developed a series of so-called rapid soil tests, the basis of which is an attempt to duplicate in the laboratory the absorptive capacity of the average

growing crop, and to determine not with chemical accuracy but in general terms, the plant-food levels of a given soil. Even the most enthusiastic supporter of the rapid soil tests would not be pre-

Editor's Note

NOT SO LONG AGO there was hostility between lime and fertilizer manufacturers. This article is frank recognition by fertilizer manufacturers of the importance of lime to the successful use of their own products.

Not so long ago the agricultural lime salesman merely determined whether soils were neutral, acid or alkaline. Now he has to know how acid or alkaline—the pH value—if he is to sell his product intelligently.

This article will prove helpful to every agricultural lime producer who will read it carefully.

—The Editor.

pared to consider them as more than indicative. They do, however, place in the hands of a well-trained agronomist, familiar with the soil and crop conditions of a given area, an additional tool to help recommend a soil fertility program adapted to the particular field.

Importance of the pH Scale

From the standpoint of better farming, the third development, which is perhaps more significant and of greater fundamental value to the farmer, is the gradual accumulation of a fund of knowledge with respect to the effect that changes in the pH scale have on the whole crop-producing power of the soil. In the old days when we found a sour soil we confidently recommended lime. It did not make any particular difference whether we were dealing with a light sandy soil or a heavy clay loam. Now we realize that the application of lime not only corrects the acidity but creates an entirely new set of soil conditions, which must be understood and taken into consideration in a soil management or soil fertility program. I would sum-

marize these advances from the standpoint of the farmer and from the standpoint of the ability of our respective industries to better serve the farmer, briefly as follows:

First, the ability to accurately determine the kind and amount of lime required. Second, the ability to determine the plant-food levels of the major mineral elements, notably phosphoric acid and potash, and third, a better understanding of the changes that occur in the soil when a change is made in its pH value.

Absolute Necessity For Use of Lime

In our own organization we have for many years followed the plan of investigating personally every report which reaches any of our sales offices with respect to unsatisfactory results from the use of any of our fertilizers. A standard report is made covering every known factor that may affect the success or failure of any crop. With the single exception of damage caused by bringing a highly concentrated fertilizer in contact with the seed or seed piece, the presence of excessive acidity in the soil is the most common cause of so-called fertilizer injury. It is therefore of vital importance to every fertilizer manufacturer to encourage the rational use of lime, not only from the standpoint of helping the farmer obtain larger yields of better quality, but also from the standpoint of protecting our own selfish interests in avoiding the inevitable crop failures which so frequently result when acid types of fertilizers are used on soils which are already so sour as to partially inhibit growth.

In an effort to help our customers secure the best possible results from the use of our fertilizers, we have occasion to obtain a great many soil samples from some thirty different states. At the time that these soil samples are obtained we secure, or attempt to secure, a complete field history, which gives us a record of the amount of fertilizer used each year, the kind and amount of lime applied if any, the application of stable manure if any, the cover crops grown, and the yield of the crops grown on this field. We further record the soil type, slope, drainage, and the usual rotation as well as the crop which the farmer intends to grow the next year.

* Abstract of a paper read at the National Lime Association Convention, May 10, 1938, Cincinnati, Ohio.

When the soils are tested by the so-called rapid method and the pH value determined, an agronomist who is familiar with the particular area where the farm is located, and in many instances has actually taken the soil samples, is in position to utilize this information and make constructive suggestions with respect to all phases of the farmer's problem.

Undeveloped Market For Agricultural Lime

During the past year our studies have shown an acute need for lime on more than 300,000 acres of land. We have specifically recommended the kind and amount of lime required for the crop to be grown on the particular soil tested. The thing that surprised us most is the fact that in so many areas there is no convenient source of lime, and it is my judgment that the market for agricultural lime is perhaps less fully covered than for any other basic commodity which the farmer buys.

With this brief picture of the reasons why the fertilizer industry feels that it is worthwhile to do everything within its power to encourage the rational use of lime, we may with propriety ask the question: "Why should lime manufacturers encourage the use of fertilizer?" Every man has heard the old Scottish adage, "Lime and lime without manure makes both farm and farmer poor." While there is the ever-present competition for the farmer's dollar, I think that it is worthwhile for all of us to remember that the problem of plant feeding is primarily a problem of balance. In our own organization we frankly tell farmers in many instances that it is a waste of time for them to purchase commercial fertilizer until they have corrected the pH value of their soil to a point where the crops which they wish to grow will thrive.

It would be unfair for the fertilizer industry to expect the lime industry to assume the responsibility for its sales work. On the other hand, you men who occupy responsible management positions have a very distinct obligation both to your own organizations and to the farmer whom you serve, in being sure that his soil management program is sound and in encouraging him to use the proper amounts of plant foods to take care of the crop needs in order to secure successful results.

It is far saner from the standpoint of building a sound agricultural program to encourage a farmer to divide his available funds in a rational manner than for either the fertilizer manufacturer or the lime manufacturer to attempt to "grab more than his legitimate share."

The work of the National Joint Committee on Fertilizer Application has de-

veloped a great fund of very valuable knowledge with regard to the proper placement of fertilizers with respect to the seed or seed piece. With the exception of grain crops which are fairly resistant to fertilizer injury, and can therefore be planted in the combination grain and fertilizer drills, the experiments in general show that the best results are obtained where the fertilizer is applied in two bands, one to three inches distant from the seed or seed piece and slightly below the level of the seed piece. This method of fertilizer placement makes it practical to go ahead and apply the lime broadcast and work it into the soil, and then immediately plant without waiting for the lime reaction to be completed. Under the old broadcast method there was the ever-present danger of reverting the phosphoric acid of the fertilizer to the insoluble form when the lime and fertilizer was applied at the same time.

What Kind of Lime?

The question which the average farmer asks most often is, "What kind of lime should I use?" Taking the country as a whole, the answer would be, "any kind." Those of us who have had an opportunity to study the results obtained from various types of lime and who recognize the chemical variations are more selective in our advice.

In our own work we prefer to use dolomitic hydrate in all areas where the magnesium deficiency is known to be important. In those areas where the native supply of magnesium is adequate a high calcium lime is equally satisfactory. The hydrate has a distinct advantage over the ground limestone because it is usually more active and it is, therefore, possible to foretell within reasonable limits the changes in the pH of the soil which a given application of lime will produce.

On a general farm where neither tobacco nor potatoes are grown in the rotation and where the pH values do not have to be as accurately controlled, finely ground limestone of either the dolomitic or calcium carbonate type will give excellent results. In many sections these are the only form that can be obtained locally.

The question that is important from the standpoint of the lime salesman and the fertilizer salesman is the amount of lime which should be applied at any one time. In our earlier experience it was customary for all of us to recommend a quantity of lime sufficient to bring the pH value of the soil up to a neutral point or nearly so. While such a recommendation is necessary and probably justified when crops like alfalfa, sweet clover or certain of the other legumes are to be planted, it

should be accompanied by specific instructions to be sure that half of the lime is applied before plowing and the balance, certainly in the form of a hydrate, applied on the rough furrow and thoroughly harrowed into the soil in order to insure prompt neutralization.

As a general proposition our experience shows that the best results are obtained where small applications of lime are made regularly in the rotation rather than to apply a large amount of lime at any one time. Particularly in the case of a top dressing operation on mixed hay, legumes or old pastures, the application of hydrated lime should never exceed half a ton to the acre, even if this is applied during the dormant period. Where the carbonate form is used a ton can safely be applied. In connection with this modest application it should be remembered that lime moves very slowly in the soil and that if excessive amounts are applied on the surface, the top inch or two may be raised to a point well above the neutral and may depress the growth of the grass and clover.

Lime Promotion by Federal Government

Our Federal Government through the operation of the Agricultural Adjustment Administration and the various soil improvement and erosion control programs has done more to publicize the importance of lime in successful agriculture than the industry could possibly have accomplished in a generation. While the programs vary, the fundamental practices applicable in every state include:

- (1) The growing of clovers and alfalfa either alone or in mixtures on high land.
- (2) The development of good sods on permanent pastures.
- (3) The production of sweet clover, lespedeza or other cover crops to be plowed under in rotational land.

Each of these three major practices require for its successful accomplishment the use of ample quantities of lime, and in most areas considerable amounts of commercial fertilizer. Because of the fact that phosphoric acid is the greatest single deficiency in most sections, only that material is included in the benefit payments, except in a relatively few of the older agricultural states where nitrogen and potash are also vitally essential to successful seedling.

Lime and fertilizer intelligently used in a sound farm management program are going to do more to safeguard the future of our agricultural lands and the safety of our valley cities than any other two single factors. Soils covered with

(Continued on page 43)

Use Waste CO₂ Gases from Adjacent Lime Plant in Making

DRY ICE FROM LIME KILN GASES

By STAFF EDITOR

PROBABLY THE ONLY PLANT in the United States utilizing the kiln gases from a commercial lime plant to manufacture solid carbon dioxide ice has gone into production at Alabaster (Siluria), Ala. The plant was built at a cost of about \$175,000 adjacent to the shaft kilns of the Alabaster Lime Co. Operation and control of the plant producing solid carbon dioxide ice, however, is vested in a separate company.

Recover CO₂ from Two Kilns

The Alabaster Lime Co. operates three 14- x 55-ft. shaft kilns fired by Louisiana natural gas, and manufactures a high grade chemical lime. Stone fed into the kilns tests better than 99 percent CaCO₃, and the production of each kiln is about 15 tons of quick lime in 24 hours.

Capacity of the new "dry ice" plant is rated at 15 tons daily or the equivalent of one kiln's lime production. While one kiln in continuous operation can furnish the needs for the carbon dioxide plant, ducts have been installed into the tops of two kilns, in the event that business conditions might justify operation of only one kiln or repairs are necessary to either. The third kiln can be connected up very easily to furnish gases into the same raw gas main lead if it should ever be necessary.

Gas escaping from the kilns, by analysis, is a mixture of 25 percent CO₂, 4 percent O₂ and the remainder is nitrogen. Of the 25 percent CO₂ recovered for the manufacture of dry ice, about 10 percent is a combustion product from burning natural gas fuel.

A seal has been installed by the Alabaster Lime Co. on the top of each of the two kilns which is held in place by weights. In charging stone into the kilns, the weight of the stone opens the seal, which is immediately returned to the closed position by the weights. Loss of CO₂ during the charging of stone does not exceed two or three percent in a day's operation.

Auxiliary Stacks on Kilns

To protect the lime plant against the accumulation of excess gases, two small auxiliary stacks were constructed, the gases being drawn from both kilns when the two are in operation. The auxiliary stacks, of course, allow the excess gases to escape if for any reason the draw-off of gases to the dry ice plant is reduced. In normal operation both stacks are open at all times, and gas is drawn off from both kilns. This is to guard against too great a draw-off of kiln gases which would raise the temperature too high in the lower ends of the kilns or allow the passage of too much air through the

kilns and increase the consumption of natural gas per ton of lime. While the dry ice plant has not been in operation a sufficient length of time to make actual determinations, it is probable that the yield of lime in the kilns has been increased by the induced draft.

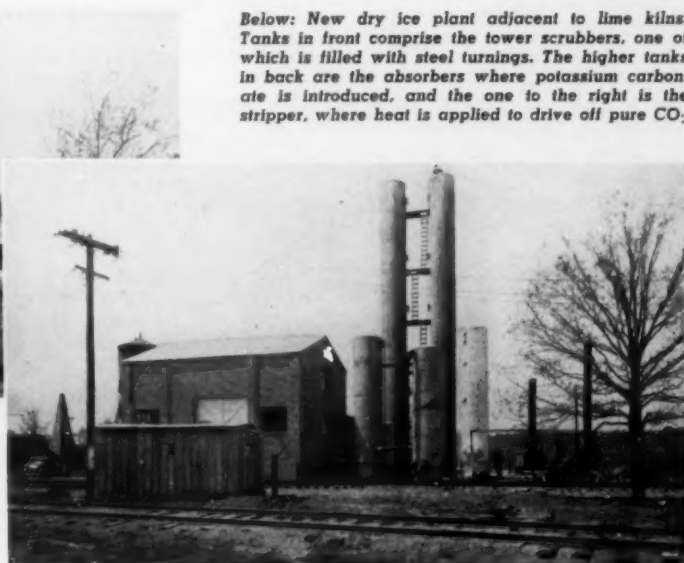
Processing CO₂ for "Dry Ice"

Gases are pulled from the tops of the kilns at about 450 deg. F. through scrubbers and discharged into the dry ice making system by vacuum created by a compressor. The compressor system manufactured by Clark Bros. Co., Olean, N. Y., consists of a 300-hp. Clark vertical natural gas engine driving an ammonia cylinder, a raw gas booster cylinder and a 2-stage CO₂ cylinder. These cylinders are 13- x 14-in., 12- x 14-in. and 8½- x 14-in., respectively.

In the manufacturing process, the first step is the passage of the raw kiln gases through a vertical gas scrubber filled with steel turnings. Water enters the top of this vertical cylinder and passes countercurrent to the rising gases. The gases are washed in this unit, and the low dust content is removed. From this scrubber, the gases enter the bottom of a similar scrubber charged with 3- x 4-in. crushed rock where further washing takes place and any sulphur



Above: Lime plant of the Alabaster Lime Co. Gases are drawn off from the top of shaft type kilns through the pipe, shown in the illustration, and are utilized to manufacture dry ice



Below: New dry ice plant adjacent to lime kilns. Tanks in front comprise the tower scrubbers, one of which is filled with steel turnings. The higher tanks in back are the absorbers where potassium carbonate is introduced, and the one to the right is the stripper, where heat is applied to drive off pure CO₂



Left: Boiler which supplies steam for the stripper; rock scrubber and absorber tanks, and CO₂ gas holder with a capacity of 7000 cu. ft. Right: Close-up of machine in which aluminum oxide absorbs moisture from CO₂ while under pressure

compounds are eliminated in their reaction with water and CaCO₃. Water passes through the rock scrubber in the same manner as in the first scrubber.

Gases from the rock scrubber enter a water separator filled with steel turnings, where the velocity of the gases is reduced to allow the water to be drawn off before the gases enter the compressor cylinder. From this separator the gases enter the booster cylinder, and are forced at 9 p.s.i. through two horizontal gas coolers to remove the heat of com-

pression and reduce the gas temperatures to about 70 deg. F. These coolers are horizontal cylinders with internal tubes through which cold water is forced as gases pass through the main cylinders.

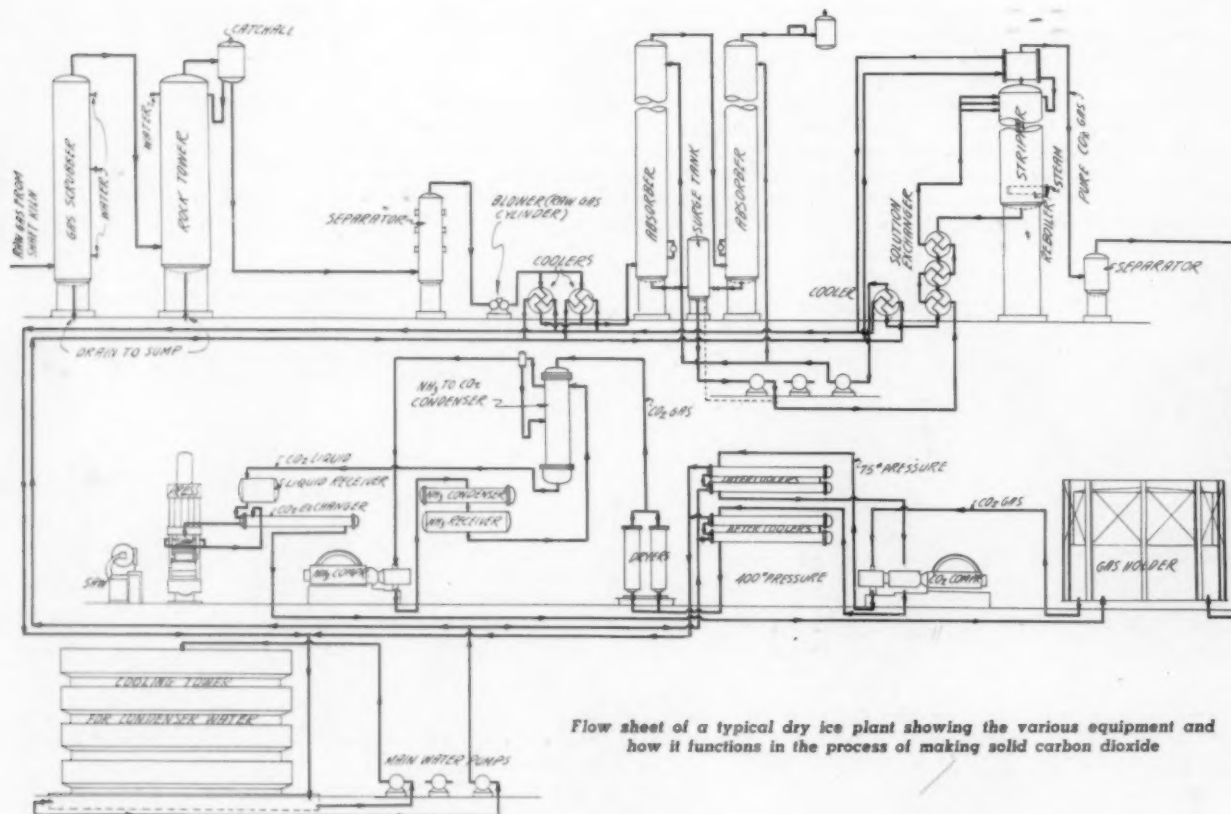
Chemical Process

The next step is the passage of the gases through the two absorbers where the first chemical reaction takes place and the gases other than CO₂ are released to the atmosphere. The absorbers

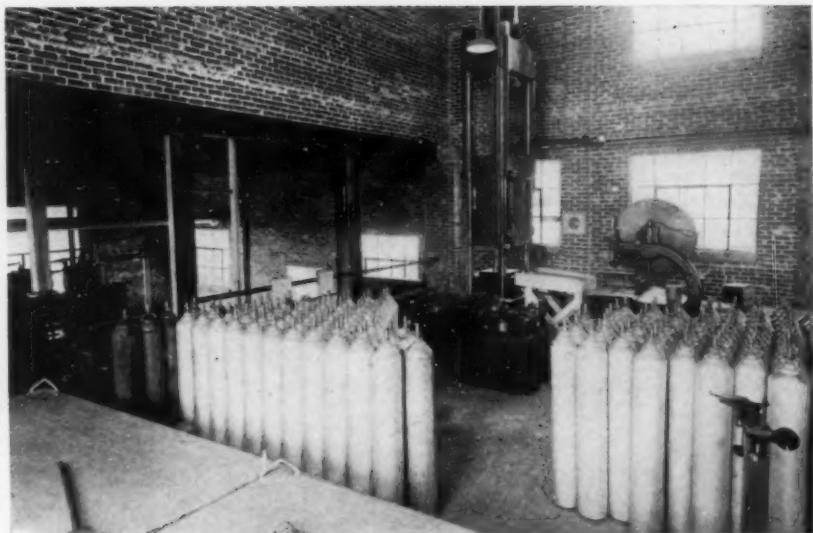
are vertical steel cylinders 59-ft. in height.

Potassium carbonate is circulated through the two absorbers, entering at the top, and reacting chemically with the CO₂ to form potassium bicarbonate. Other gases exhaust through the open tops of the absorbers. The potassium bicarbonate is then pumped to a stripper where heat is applied and pure CO₂ gas is driven off at the boiling temperature.

The potassium carbonate and potas-



Flow sheet of a typical dry ice plant showing the various equipment and how it functions in the process of making solid carbon dioxide



Hydraulic press and band saw for cutting dry ice into 10-in. cubes, shown back against the wall, cylinders for shipping liquid CO₂, and in the foreground is the cork-insulated storage chamber for solid dry ice

sium bicarbonate are pumped through the system by Ingersoll-Rand pump units driven by 20-hp. G.E. integral motors. Capacity of the pumps is 250 g.p.m. each under a 150-ft. head. In the stripper, which is insulated with hair-felt, heat is applied to drive off CO₂ gas by means of a coil supplied with steam by a 125-hp. boiler.

CO₂ gas driven off in the stripper is forced through another cooler of the water tube type, with cold water passing through the tubes, followed by a separator where the water is removed from the gas, and it is then passed into the gas holder. The gas holder is 21 ft. in diameter, and has a capacity of 7000 cu. ft. of CO₂ gas.

From the gas holder, the pure CO₂ gas enters the CO₂ compressor cylinder, where it is compressed to 400 p.s.i. At this pressure it is forced through a size 500 "Lectrodryer" manufactured by the

Lectrodryer Pittsburgh Corp., where aluminum oxide absorbs moisture existing in the CO₂ gas at this pressure. The use of aluminum oxide for absorbing moisture is a patented process.

After the removal of moisture, the pure CO₂ gas is liquified at a temperature of 0 deg. F. in the ammonia condensers (2) which are insulated by 6-in. of cork. Liquid CO₂ is then run to what is called a press where it is permitted to boil down to atmospheric pressure. In this final step in the process, about 50 percent CO₂ "snow" is produced, and the remainder, pure CO₂ gas, returns to the gas holder to recirculate through the system.

Carbon dioxide "snow" is pressed into 20- x 20- x 10-in. solid blocks under a total pressure of 275 tons applied in a H. P. M. hydraulic press. These blocks, cut to 10-in. cubes by a Jones-Superior band saw, are wrapped in paper

and placed in storage. Solid dry ice loses about one percent by weight when stored 24 hours in plant storage, which is insulated with 12-in. of cork. Liquid CO₂ is drawn off from the line feeding liquid CO₂ to the press, and is shipped in cylinders under 1000 p.s.i.

Use Quarry Water for Cooling

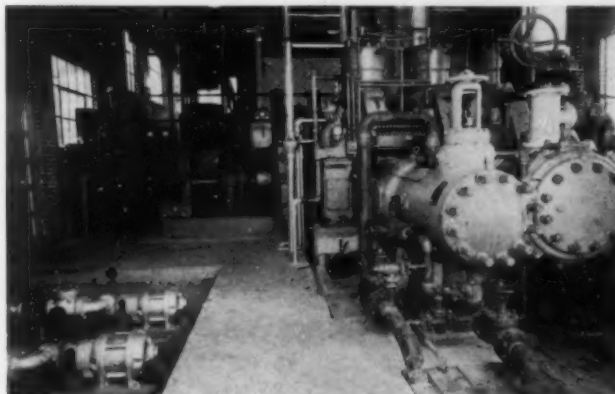
Water for the entire system (700 g.p.m.) is furnished through a 6-in. centrifugal pump installed by the "dry ice" company in the quarry of the Alabaster Lime Co. The quarry is constantly filling with water and therefore, the lime company is benefitted to a considerable degree when the dry ice plant is in operation.

Power for the latter plant is generated by a 6-cyl. 180-hp. Clark natural gas engine driving a 156 kv. a. generator having a 3 kw. d-c. generator, driven from the main shaft for excitation. The generator and exciter were furnished by Electrical Machinery Manufacturing Co. The gas engines are started by compressed air under 250 p.s.i. pressure developed by a 3½- x 2½-in. Gardner-Denver compressor driven by a Wisconsin motor.

In its contract with the Alabaster Lime Co., the dry ice company has been paying for CO₂ on the basis of tons of solid CO₂ ice manufactured, and it is stipulated that the process be operated in such a way as to not lower the quality of the lime burned in the kilns.

H. G. WILLIAMS SLATE CO., Granville, N. Y., has resumed operations in its New York quarries, after a shut-down of five months, to take care of an upturn in the slate business.

ALABASTER LIME CO., Alabaster, Ala., has increased its capacity for burned lime by one-third with the installation of a third 14- x 55-ft. shaft kiln. The kilns are fired by natural gas.



Left: Natural gas driven compressor on the right having an ammonia cylinder, a pure CO₂ cylinder, and one for handling raw gas. On the left are the pump units for pumping potassium carbonate into the absorbers. Right: Showing natural gas engine direct-connected to the generator for developing electric power, and to the left, the engine compressor unit



Left: Boiler which supplies steam for the stripper; rock scrubber and absorber tanks, and CO₂ gas holder with a capacity of 7000 cu. ft. Right: Close-up of machine in which aluminum oxide absorbs moisture from CO₂ while under pressure

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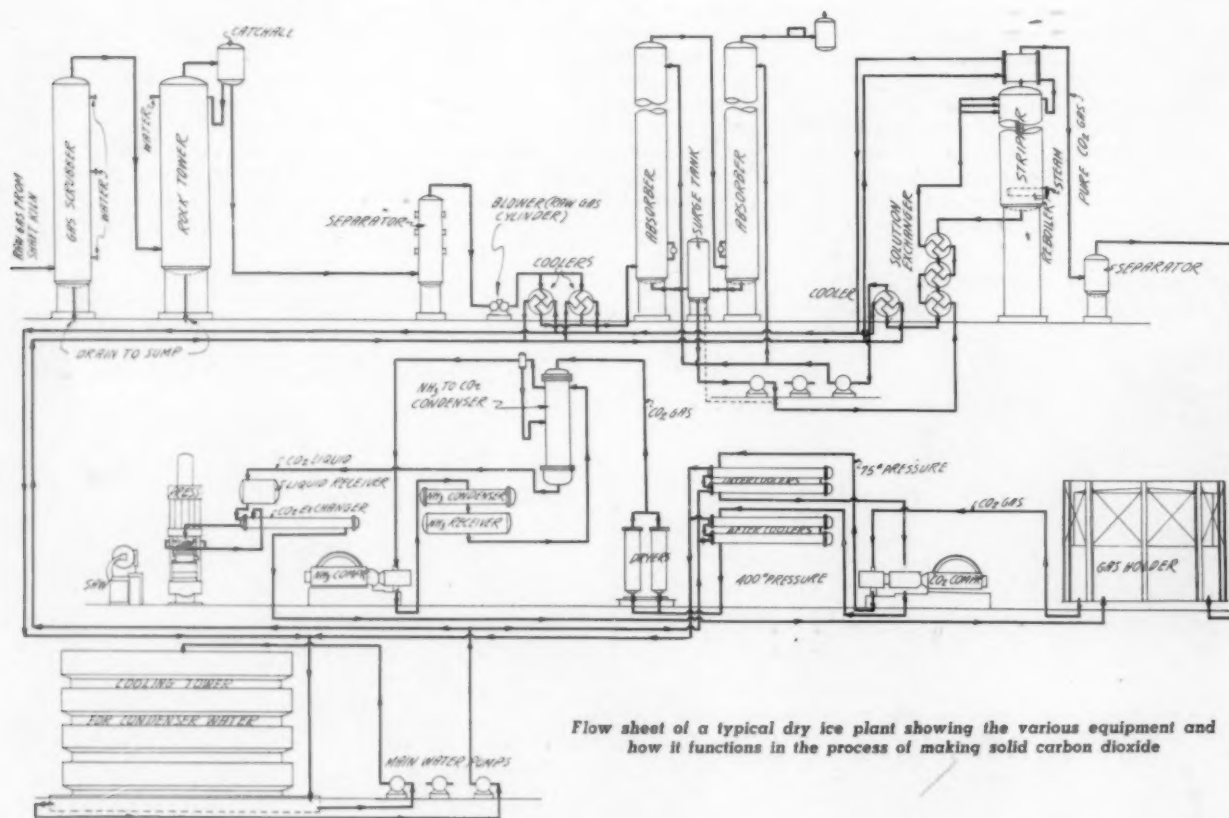
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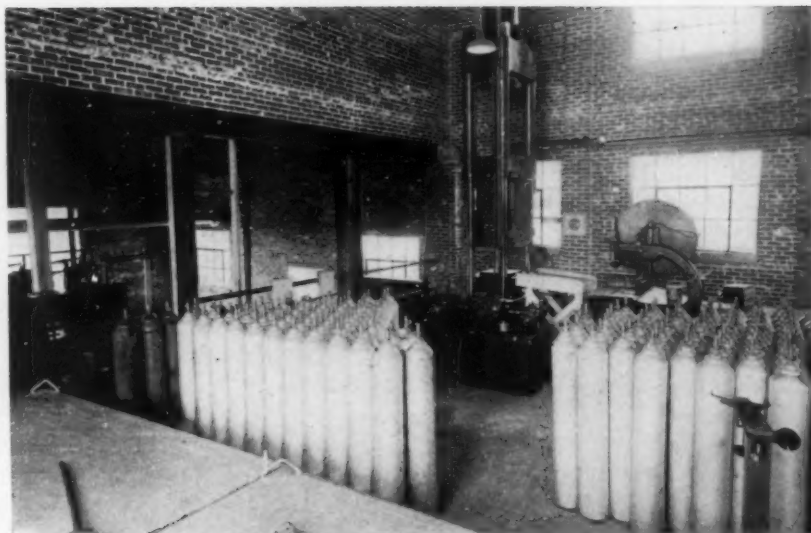
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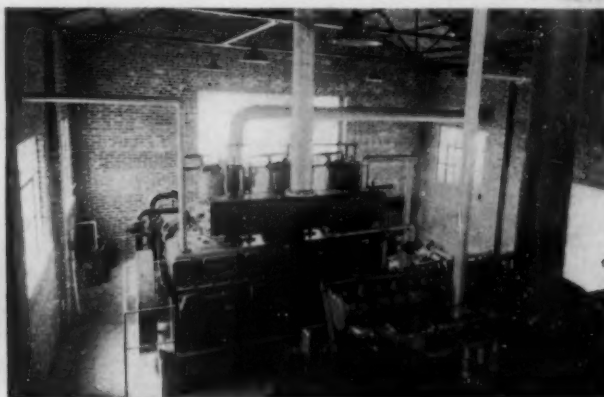
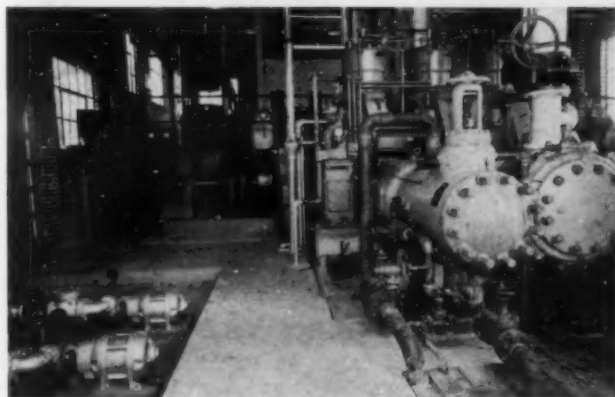
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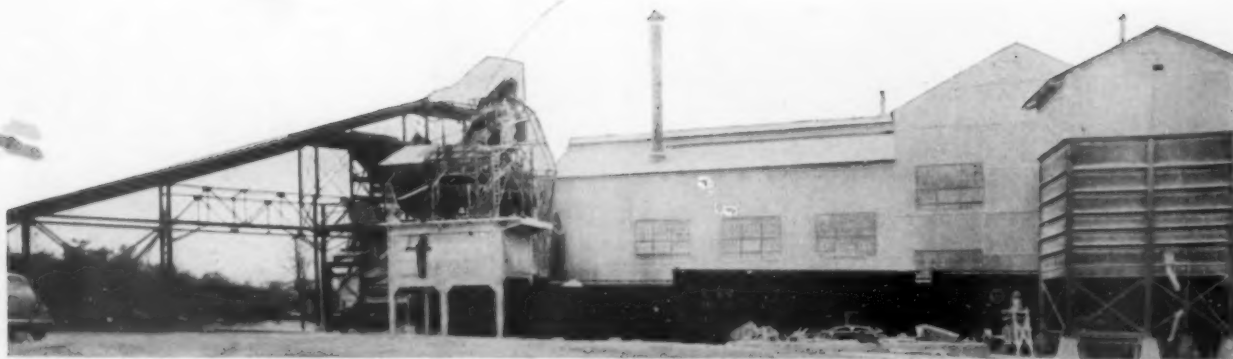
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To the left, stone crushing and sizing machinery; and to the right, the new building

Revamp Aggregates Plant to Produce Stone Fines

TUBE-MILLING DOLOMITE

FLUXSTONE AND AGGREGATES were the major outlets a few years ago for the Dolcito Quarry Co., Birmingham, Ala., and fines were a valuable by-product. However, stone fines have now assumed greater importance and this year the plant at Tarrant City, Ala., has been entirely revamped for the manufacture of stone fines. The principal markets are pulverized agricultural stone, asphalt filler stone and mine dust.

New Grinding Mill

An 8- x 26-ft. Allis-Chalmers tube mill, of the type commonly used in portland cement mills for grinding raw materials and cement clinker was the principal unit installed in changing over the plant. The mill is fed $\frac{1}{8}$ - to $\frac{3}{4}$ -in. dolomite stone from a 100 ton bin above through a shaker feeder followed by the standard screw feed. Discharge of pulverized material is at the center through $\frac{3}{4}$ -in. spaced grate bars. The mill is mounted without any slope, and is turned 19 r.p.m. by a 600-hp. Allis-Chalmers motor, with reduction through an S7 Falk gear reducer. Grinding media comprises 27 tons of 3-, 2 $\frac{1}{2}$ - and 2-in. round steel balls proportioned to produce a desired percentage of 200-mesh product (asphalt filler and mine dust) when passed through a mechanical air separator.

Plant crushers and screens formerly used to produce a larger product, prior to installation of the tube mill, are in their same relative position, the only change being the use of a Symons No. 4 cone crusher in place of a hammer mill type, and a tighter setting of the crushers to produce more fines for feed to the tube mill.

The primary breaker is a No. 3 McCully gyratory crusher set to crush to 1 $\frac{1}{2}$ -in. and under. Throughs from this crusher are elevated and passed over a 4- x 8-ft. Simplicity double-deck vibrating screen now operating as a single-deck screen. Plus $\frac{3}{4}$ -in. stone from this screen is then passed over a similar 4- x 8-ft. single-deck screen, since two screens were already in use and one had insufficient capacity.

Throughs from both screens fall into a 150-ton bin, and the oversize from the second screen is reduced to $\frac{3}{4}$ -in. minus through the No. 4 cone crusher, which is driven by a 150-hp. motor. The crusher throughs are elevated by the same bucket elevator and again passed over the screens.

Stone ($\frac{3}{4}$ -in. minus) from the bin is fed to a 6- x 30-ft. Ruggles-Coles dryer, formerly used for drying screenings in the production of mine dust and asphalt filler on a smaller scale. The dryer, fired by a Firite coal stoker, handles about 40 tons of stone per hour.

Dried material is elevated by a chain bucket elevator, 40-ft. centers, to a 4- x 8-ft. Link-Belt single-deck mechanically-vibrated screen with $\frac{1}{8}$ -in. square openings. The fines are separated out, and placed in a 300-ton bin over a conveyor, 30-ft. centers, followed by a second conveyor on 65-ft. centers both with 30-in. belts. From this bin, the $\frac{1}{8}$ -in. minus product is spouted to a portable Stephens-Adamson box car loader and placed in cars for bulk shipment.

The $\frac{1}{8}$ - to $\frac{3}{4}$ -in. stone goes to a 100-ton bin, and is the feed for the tube mill. The tube mill has an average production of about 40 tons per hour. Probably about 8 tons of minus $\frac{1}{8}$ -in. stone

per hour by-passes the mill into the 300-ton bin.

Tube mill discharge, containing considerable 200-mesh material, is carried over an open conveyor 112-ft. centers, 14-in. belt, to a 14-ft. American air separator (Kent) where the finer products (85 percent through the 200 mesh) are recovered. This fine product goes over an identical belt conveyor to storage and a third belt conveyor takes the rejects to a 4- x 8-ft. Allis-Chalmers double-deck, enclosed low-head vibrating screen. Only one deck is used to make a separation over $\frac{1}{8}$ -in. openings. Plus $\frac{1}{8}$ -in. stone drops into the mill feed bin, and the throughs are placed in the 300-ton bin.

Shipments of the fine material are made in bulk over belt conveyors to cars or in sacks. The bagged product is placed in 100-lb. paper bags by a two-spout Bates bagging machine, which has been made portable for use on the two bins. The products contain 55 percent CaCO_3 , 43 percent MgCO_3 , and two percent of alumina, silica and iron oxides.

Catch Valuable Dust

In addition to the regular mill capacity, from 10 to 12 tons of very fine material is recovered daily from the Pangborn bag-type dust collector, and is blended with the asphalt filler and mine dust products. The collector receives its fines through ducts leading to the tube mill discharge, the screens, the dryer discharge, and feeds and discharges to and from the bucket elevators. Occasionally larger sizes of material for concrete aggregates and ballast are produced by resetting the crushers and changing screen cloths.



Views of the Dolcito Quarry Co. plant, Tarrant City, Ala. Fig. 1: Secondary crusher for sizing to $\frac{3}{4}$ -in. minus. Fig. 2: Enclosed vibrating screen where a split is made at $\frac{1}{8}$ -in. Note piping to dust collector. Fig. 3: Looking down on dryer through which all material passes before entering tube mill. Fig. 4: Tube mill which has a charge of 27 tons of steel balls. Fig. 5: Tube mill discharge goes over belt conveyor to air separator for a 200-mesh separation. Fig. 6: Packing machine placed on rollers and held firmly in place by jacks

Promotional Methods Used In New Orleans to

SELL AGED LIME PUTTY

JAHNCKE SERVICE, INC., New Orleans, La., large producer of sand and gravel, shells and ready-mixed concrete, building supply dealer, manufacturer of concrete products and operator of dredging boats has embarked on a new venture—the manufacture and sale of aged lime putty.

Lime putty, like any other new product, must be sold through a sound educational merchandising program if any sales volume is to result and there is to be substantial repeat business. Jahncke Service, therefore, availed itself of the services of a skilled and highly trained sales consultant.

Norman G. Hough, former president and general manager of the National Lime Association, was engaged to properly introduce lime putty to the building trade—through engineering selling by a man who has an intimate knowledge of the product and is equipped, through many years of experience, to exploit its virtues and substantiate his claims for it by technical data.

Mr. Hough came to New Orleans in February after successfully introducing aged lime putty in Cincinnati as a special consultant for the Richter Concrete Corp. After 70 days in the employ of Jahncke Service, selling and servicing the product, Mr. Hough left to give another manufacturer a "boost." At that time the entire output of the new plant was contracted for, and Jahncke Service had difficulty in meeting demands with its present facilities. The Charity hospital alone, now under construction in New Orleans, will take 10,000 cu. yd. of mortar, or the plant's capacity at the present time.

Solve Architects' and Contractors' Problems

Mr. Hough's formula of success was an intimate knowledge of the product, a firm belief in the merits of his product and an understanding of the architects' and contractors' problems and what they desired in the way of a mortar or a plaster, and plenty of personal calls.

Through his past experience, he recognized that in selecting a mortar architects thought mainly in terms of wall leakage and costs while contractors considered workability, ease in handling and savings in labor. In introducing lime putty for plaster coating, his selling point was based on the plasticity and cost, which are the major factors in selecting a good plaster.

Architects in New Orleans were "open" to any suggestion which could be "shown" to be a solution to the leaking wall problem. In treating this problem, Mr. Hough had all the facts on hand to discuss the water retaining capacity of various mortars, characteristics of a mortar needed for a proper bond and the maintenance of bond for different mortars along with engineering data to prove his point. It isn't improbable that the architect would ask questions or demand proof for claims made that might prove embarrassing to a less informed sales representative.

Educating Salesmen

Mr. Hough also assisted in educating the company salesmen, equipping them with information and facts that will prove invaluable to them in their sales efforts. He also conducted meetings, in which he told the salesmen the reason for establishment of an aged lime putty plant, the advantages of lime putty as compared to competitive materials, and passed along much information vital in overcoming sales resistance.

After conducting these meetings, Mr. Hough made calls with individual salesmen, where he was introduced as a representative of Jahncke Service, and he had the opportunity to discuss the merits of his product. A number of direct calls on architects and contractors were also made by Mr. Hough.

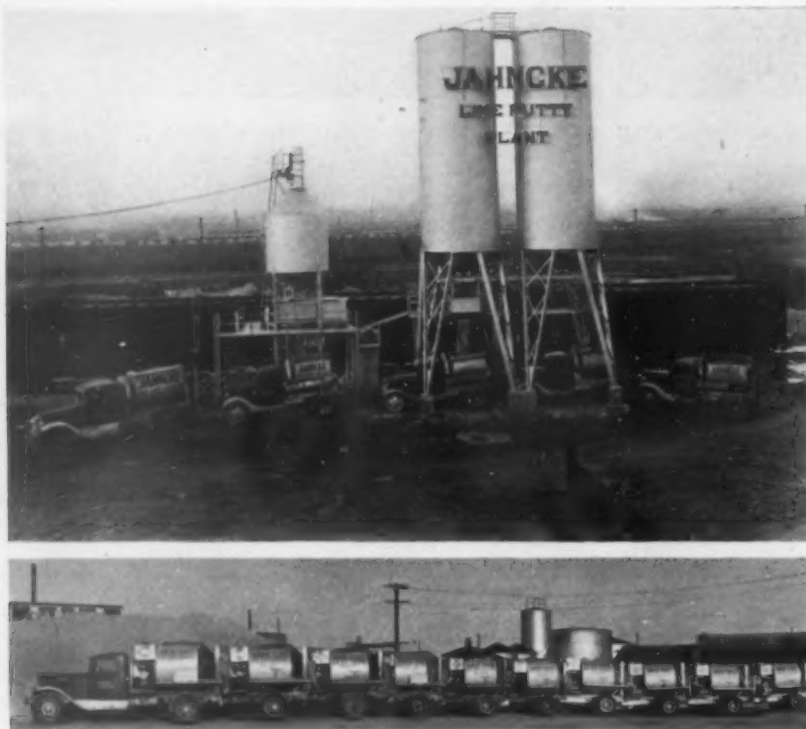
Before leaving New Orleans, an employee was selected for development as a lime putty specialist.

Plant Equipment

The plant is a Brooks-Taylor standard two-tank unit, installed January this year in the company's Claiborne yard. The lime used is a rotary kiln quick lime product to insure against either over or under-burning. It is shipped to the plant in bulk and elevated by bucket elevator to a 17-ton storage tank over the slaker.

(Continued on page 43)

Above: Lime putty plant with slaker shown to the left and aging tanks to the right. Truck mixers are of the revolving blade, open-top type. Below: Fleet of new truck mixers of the revolving drum type



Latest Improvements Increase Mill and Quarry Efficiency

KEEP OLD CEMENT PLANT MODERN

By BROR NORDBERG

AT SPEED, IND., the Louisville Cement Co. plant is rapidly becoming one of the most modern portland cement units in the country. In its modernization plans, recent years have seen operating methods changed to conform to today's conception of how cement should be properly made. In several other ways the plant now differs from the conventional design.

When last described in *ROCK PRODUCTS*, page 44, August, 1936, air separation had been introduced in closed-circuit with the raw material tube mills. At the same time, proportioning scales of the most modern type were installed to proportion with exactness, the materials to go into the raw mill bins, and also the gypsum and clinker in finish grinding.

These operating developments, which are important factors in controlling quality and in governing processes in the portland cement manufacture, have been followed more recently by other improvements.

Some of these improvements represent replacements, others may differ

from the ordinary, and some are typical of trends taking place throughout the country. Yet, they are all in the direction of modernization.

Direct-Firing Coal Mills

In firing the kilns several changes have been made which are typical of the current trend in the cement industry. Driers, mills and feeders have been replaced by Raymond direct-firing coal mills which handle the grinding, drying and firing in one operation. Installation of direct-firing mills, regardless of make, has resulted in a cleaner house, has guarded against spontaneous combustion and the explosion hazard, simplified the firing operation, and has reduced the coal consumed when compared to other firing practices.

This plant has six kilns, two of which are 7- x 100-ft., two are 8- x 10- x 160-ft. and the other two are 10- x 150-ft. Each of the four larger kilns is now being fired by a No. 402 bowl mill. Primary air is taken from the kiln hood in the conventional manner, blended

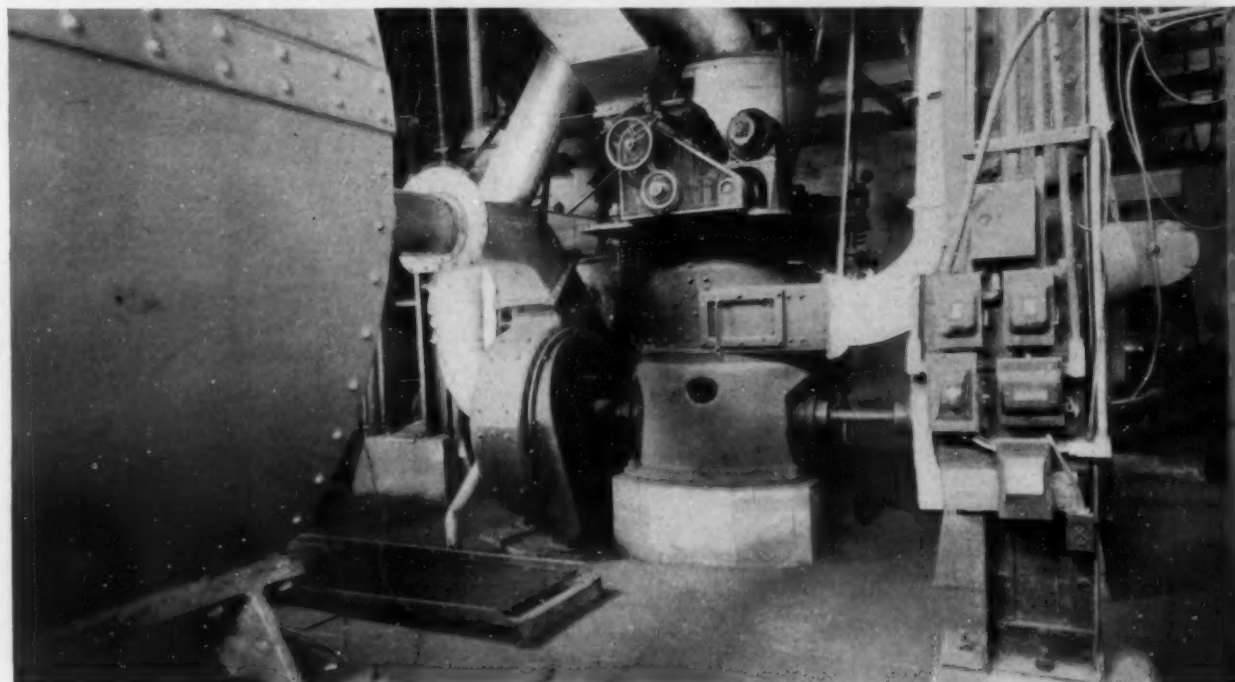
with air at room temperature, and introduced into the mill to dry the coal while it is being ground. The mixture of primary air and pulverized coal is injected into the kiln at about 175 deg. F.

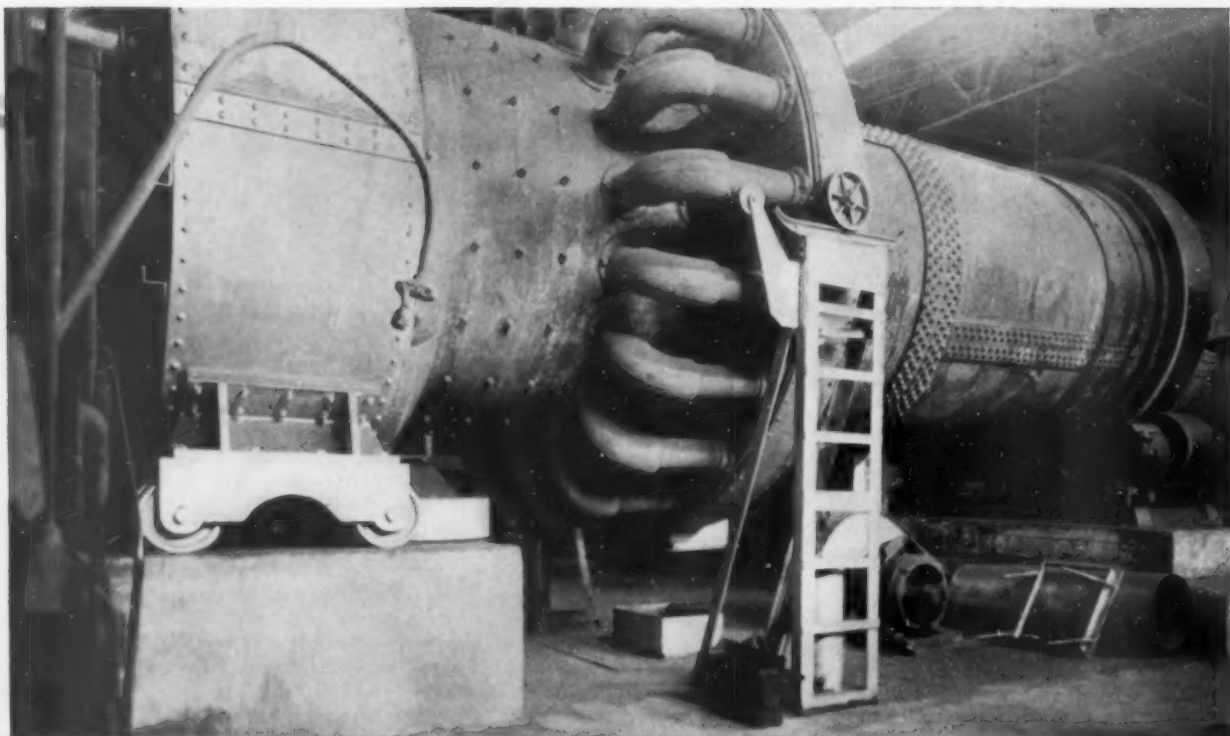
A fifth mill having similar specifications operates in conjunction with a bin system as a source of fuel supply for the two short kilns and the 8- x 80-ft. driers for coal and shale. Pulverized coal from the mill discharges through a cyclone into a small bin from which a 6-in. Fuller-Kinyon system distributes it to bins at the driers and the short kilns. From these bins the coal is introduced into the driers by Fuller-Lehigh feeders and is fed into the short kilns by Bailey feeders.

An interesting replacement has been made on two of the four larger kilns. Jones speed reducers of the herring bone type with direct motors, on a common base, have been installed to supply all but one step of reduction between the motor and the kiln drive pinion.

The two 10- x 150-ft. kilns receive secondary air for combustion through

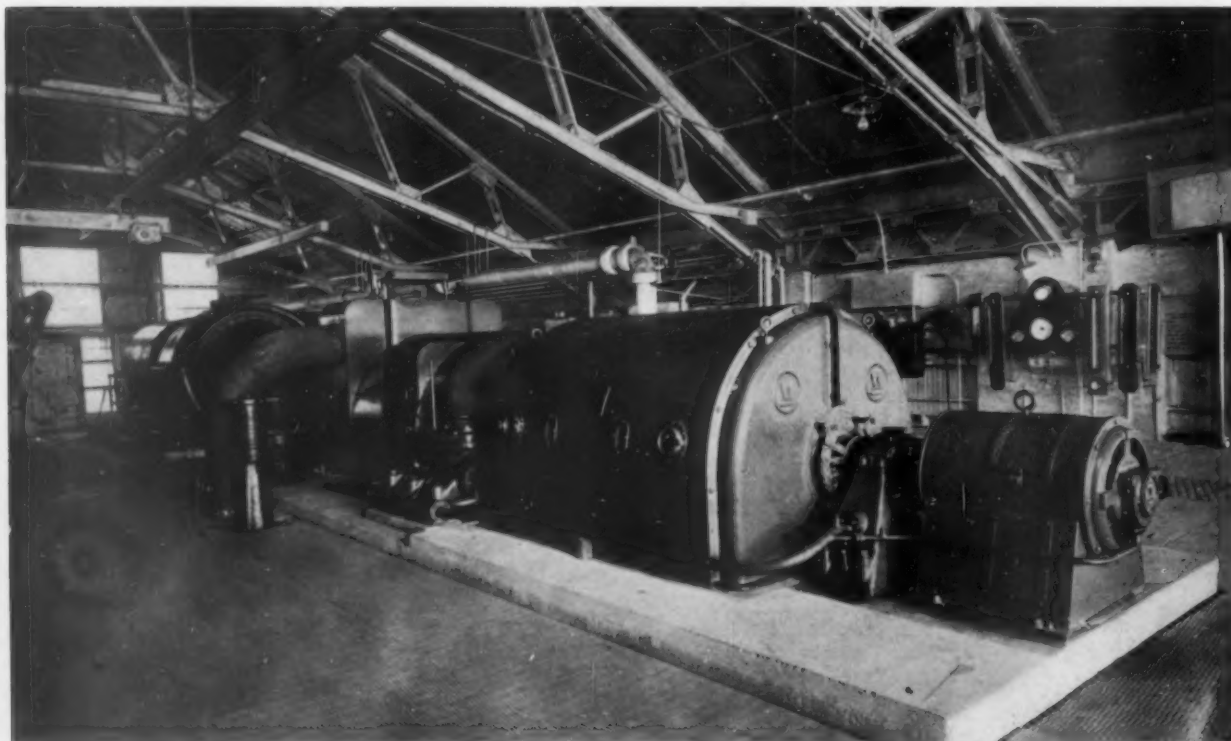
One of four direct-firing coal mills which serve the four larger kilns. Two of the kilns are 10- x 150-ft., and two are 8- x 10- x 160-ft.





Two 10- x 150-ft. kilns receive secondary air for combustion through the ports of the heat recuperators. This installation was made primarily to effect sudden chilling to 900 deg. F. in the hot zone of the kiln

View of power plant showing high pressure 3750 kv.a. turbine and generator which has replaced three smaller capacity units



the ports of type CI Vanderwerp recuperators, recently installed. Installation of the recuperators has been made primarily for the effect that sudden chilling to 900 deg. F. in the hot zone will have in rendering clinker to a glassy state which facilitates grinding and reduces wear and power consumption.

Grinding—Raw and Finish

During the past year or two there have been no radical changes in the grinding process.

As mentioned earlier, hair-trigger control is exercised in blending the cement raw materials over accurate proportioning scales. The raw material is ground to a fineness probably equal to or better than that in most cement mills, to expose the greatest possible surface area to kiln temperatures. This practice has very likely been instrumental in increasing the kiln output, and the question may arise as to the effect of a fine, uniform grind of raw material on the resulting clinker structure and its grindability.

Clinker is passed through four Kominuters and a Hercules mill for preliminary grinding, and it is then ground to the desired surface through four No. 18 and four No. 16 F. L. Smith tube mills.

All mills are water cooled. Three 200 hp. synchronous motors have been installed to drive tube mills which were formerly driven by belts. The clinker grinding department is now completely motorized with more than 2000 hp. of synchronous electric motors driving tube mills.

To improve working conditions in the raw grinding room, it has been equipped with a large Norblo bag-type dust collector. This collector recovers the dust throughout the room, at the feed and



Train of 9 cu.-yd. all-steel quarry cars arriving at the primary crusher. Note air hoist to pneumatically tilt cars

discharge ends of the grinding mills and elevators, and also from the automatic proportioning scales.

Feed to the kilns is now regulated on a definite volumetric basis by means of Redler conveyors, which have just been placed into operation on five kilns. The system has simplified the problem of a regulated feed, and, in its limited operation thus far, has been satisfactory in preventing flooding of material into the kilns. Raw material in the kiln hoppers moves on 9-in. conveyors, and is "dragged out" to above the kiln level where it drops through a spout into each kiln. The level of the discharge from the Redler conveyor into the kiln spout is sufficiently high with respect to the raw material in the hoppers that surging is practically an impossibility. These new conveyors replace a system of screw conveyors.

Each conveyor is driven by a 5-hp. Westinghouse slip-ring gear motor, which is being operated at variable speeds. Conveyor speeds may be readily

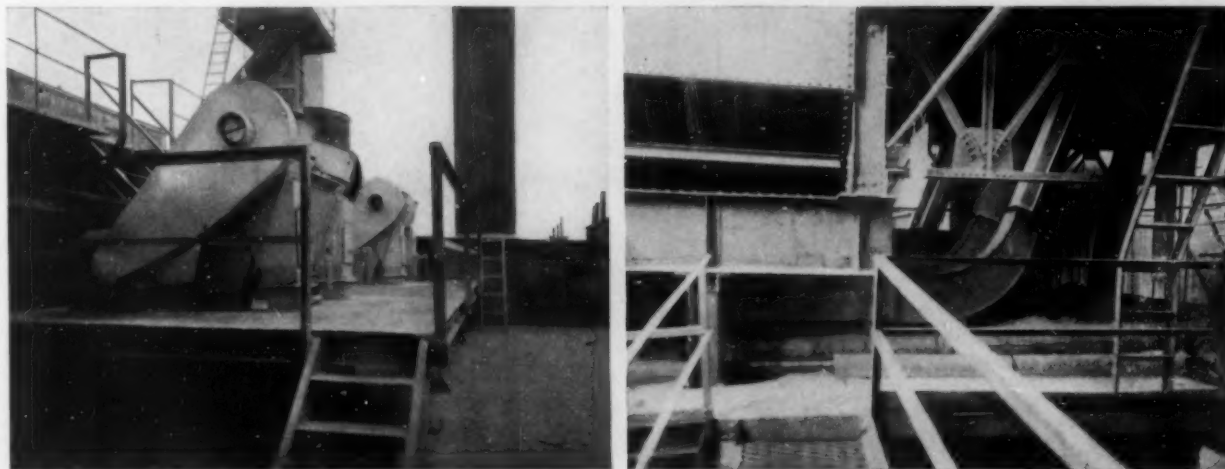
synchronized with the kiln speeds if experience should warrant this practice.

In the quarry, replacements have been made where obsolescence necessitated. A new 4¾-cu. yd. Bucyrus-Erie electric shovel is now in operation to load quarry cars. Thirty-five 9-cu. yd. all-steel, Easton "Won-Way" dump cars have recently been placed in service to deliver rock and shale to the primary crusher. These new cars are all Timken roller bearing equipped, and are dumped pneumatically by a mechanism designed by Easton. Cars are spotted for dumping by a Clyde car puller.

Electrical Power

A high pressure 3750 kv.a. Westinghouse turbine and generator has replaced three lower capacity units in the powerhouse, one of which directly furnished part of the drive for the clinker grinding tube mills. This unit is in addition to 1000 kw. Allis-Chalmers and 2500 kw. General Electric units, installed capacity.

Left: Upper section of drag conveyor installation. Right: Lower section of conveyor. Kilns receive raw material feed by means of these conveyors to reduce surges and eliminate flooding



Natural Gas Engine Used to Drive Dredge Pump

ECONOMICAL DREDGE OPERATION

PROBABLY ONE OF THE MOST ECONOMICALLY-OPERATED sand and gravel dredge boats in the country is owned by Braswell Sand and Gravel Co., Inc., at Minden, La. For a number of years this company has powered its 8-in. Amsco pump by Diesel engine, but recently has installed a new engine burning natural gas — the cheapest fuel available in that part of the country.

The new power unit is an 8-cyl. Climax natural gas engine capable of developing 210 hp., which drives, through flat belts, the pump and the hoist for both lateral and vertical movement of the suction pipe. Average power consumption in the first month's operation has been about 150 hp.

The natural gas engine speed is 975 r.p.m. and the pump impeller rotates at 600 r.p.m. as compared to 470 r.p.m. when pulled by Diesel engine. Pumping capacity has been increased, by virtue of a higher pump speed, and fuel costs per ton of gravel produced have been reduced considerably.

The dredge boat is of wood construc-

tion, 18- x 26-ft. in size, and operates about three-fourth mile from the natural gas main. A 1-in. rubber hose has been run from the main to the boat over the pontoons supporting the discharge pipeline and gas is delivered to the boat at a pressure of 10 p.s.i. Here the pressure is reduced to ½ p.s.i. by a regulator delivering gas into the carburetor.

At the present dredge boat location, material is delivered through 250 ft. of 8-in. pipe to an auxiliary stationary screening plant where trash is removed and gravel is washed and graded to specifications. From this preliminary plant graded gravel is hauled in trucks a distance of three-fourths mile to a sizing plant where it is given an added washing and sizing. This plant is of the conveyor type and has five Stephens - Adamson 6-ft. x 48-in. x 26-in. revolving sizing screens. Sand is dumped directly over a chute into cars without having to be washed or graded the second time.

A No. 4 Northwest dragline does the

stripping of overburden and also is used to loosen material in front of the suction. Capacity of the plant is from 600 to 700 cu. yd. of material in 12 hr. Natural gas is purchased for 25c per 1000 cu. ft. and the average consumption based on a month's operation is 1200 to 1300 cu. ft. per hour. Shipments are made by rail and truck.

In this part of the state of Louisiana there is considerable demand for stabilized road surfacing material for state roads, consisting of 25 percent clay, 25 percent sand and 50 percent 1½-in. stone, which is plant mixed before delivery into railroad cars.

In producing this type of material, clay balls are not removed at the auxiliary screening plant, but are retained as part of the mix. The aggregate and clay are mixed at the railroad siding by picking up gravel and clay with a clamshell bucket from their respective stockpiles on the ground and dropping the mixture once on the ground. It is then picked up again and given an additional mix on discharging into cars.



Above: Natural gas engine drives dredge pump through a flat belt drive

Below: Dragline loosening material ahead of the dredge suction pipe. Auxiliary screening plant may be seen in background



Research Has Developed New Markets For Rock Products

USES FOR QUARRY FINES

By A. T. GOLDBECK*

Engineering Director, National Crushed Stone Association

AS THE TONNAGE OF QUARRY FINES produced is large, its profitable disposal is important in any crushed stone operation. In this discussion the term "quarry fines" is applied to those products of crushed stone smaller than approximately $\frac{1}{2}$ -in. To indicate the increasing market for quarry fines, the various uses will be discussed.

In the construction of highway bases, quarry fines are used in several ways. For subgrades of plastic clay, which are muddy in wet weather, a mixture of clay and fines in proper proportion will give excellent results in producing a stabilizing layer. Quarry fines, however, possess inherent stability because of their shape and natural cementing properties, and it would seem unnecessary to use clay mixed with quarry fines. If quarry fines are mixed with clay, it is desirable to have a mixture of maximum density and it is better to underfill rather than overfill the voids with clay, particularly if a bituminous wearing surface is to be used.

Another use for quarry fines is the application of a stabilizing layer over shifting, unstable sand subgrades to aid in maintaining enough capillary moisture in the sand to help hold the particles of sand together. In all these cases, however, it must not be regarded as a wearing surface.

The best results are obtained when screenings contain sufficient dust to make for high density. The following gradations are based on Fuller's curve of maximum density, and are "ideal" gradations which can only be approximated with screenings as produced.

Total Per Cent Passing				
$\frac{3}{4}$ in.	100	..	..	..
$\frac{1}{2}$ in.	77	100	..	..
$\frac{3}{8}$ in.	65	82	100	..
No. 4	47	56	64	100
8	38	42	47	64
16	32	36	38	44
30	26	30	32	38
50	21	24	26	33
100	17	20	22	29
200	15	17	19	25

As far as practicable, the percentages of dust through the No. 200 sieve should be adhered to for the best results even though the stone dust content must be

augmented by the additions of clay or silt. Stone dust is to be preferred to clay because of its low degree of plasticity when wet.

For the purpose of making stabilized bases, there are many who advocate the



A. T. Goldbeck

use of calcium chloride as an admixture. As calcium chloride is hygroscopic and also a deliquescent material, it aids in forming a moisture film around finely divided particles, the moisture film acting as a binding medium for cementing the particles together. When calcium chloride is used with screenings, the gradation should be the same as for a plain screenings layer. Calcium chloride is applied in flake form at the rate of $\frac{3}{4}$ to 1 lb. per sq. yd. followed later in the season by $\frac{1}{2}$ lb. per sq. yd. Common salt is similarly used as an admixture.

Bituminous Stabilized Screenings

When screenings or quarry waste is mixed with bituminous materials for base construction, the gradation is used which will give the maximum density when rolled. The tabulation shown above is satisfactory for this purpose. Just sufficient water to give maximum density is mixed with the screenings, the

water making it possible to mix a low percentage of bituminous materials to make the mixture low in absorptive value. Without water the high percentage of dust would cause balling within the mixture and the coarser fractions would receive no coating. In a screenings mixture of say $\frac{3}{8}$ in. maximum size, from $3\frac{1}{2}$ to 4 percent of bituminous material is advisable. The relative effects of different gradations, different bituminous materials and the inclusion of clay in the mix have been studied by the aid of the circular track, and the results are described in more detail in another paper which appeared in the March issue of Rock Products.

It is suggested that in construction it is advisable to use plant mixes for uniformity of the bituminous mixture. For this work, a pug type mixer is preferable. The proper amount of water is first introduced into the mixer with the screenings and thoroughly mixed; then the bituminous material is finally added and mixed.

Fine sizes of stone are also used in making various kinds of bituminous wearing surfaces; such as, a surface treatment of bituminous material with fine crushed stone as a cover, a mixed-in-place treatment, or any one of several premixed materials may be used. Stone sand mixed with emulsion or cut-back asphalt makes a good wearing surface. Portland cement as a binding medium also offers possibilities for use with screenings in stabilized base construction.

Other uses for screenings stabilized by the methods previously mentioned include: highway shoulder construction; as a material to make repairs to roads where "frost boils" have occurred; and sidewalk construction along highways to reduce accidents to pedestrians.

Screenings are finding increasing use in stabilized base construction under high type pavements. A screenings sub-base is resistant to heavy pressures due to wheel loads, preventing undue bending of the wearing surface which may result in surface failure. Under a macadam base, a screenings layer serves as a blanket layer, preventing a clay subgrade from being forced upward into the large voids between the stone. Wet clay is a good lubricant and the screen-

*Abstract of a paper presented at the recent convention of the National Crushed Stone Association in Cincinnati, Ohio.

ings prevent it from getting into the macadam base. Under concrete, a screenings layer aids in extracting part of the mixing water from the freshly-deposited concrete, thereby reducing the effective water-cement ratio and adding to the strength of the concrete; screenings have a low capillary action and the quantity of water fed upward vertically through the concrete is reduced; and a cushion of screenings does not shrink and swell with changing moisture conditions like clay subgrades.

Quarry Fines in Road Surface Construction

Fine crushed stone is recognized as an aggregate of merit in such mixtures as fine and coarse graded hot bituminous concretes, various cold mixes such as the liquefier types, the emulsion types of mixtures and many others. More extensive use also should be made of fine, graded stone screenings for sheet asphalt construction. The high stability of angular stone sand in sheet asphalt makes its use for this purpose very satisfactory.

To repair road surfaces which have become worn and rough from chain-equipped traffic, a stone sand liquifier type of cold mix has been used successfully. Quarry fines in the form of dustless stone screenings have been standard for use as cover material over bituminous surface treatment for many years. Screenings for filling waterbound macadam are particularly valuable if enough fine dust is present to provide high cementing properties.

As Fine Aggregate in Concrete

Good results with stone sand as fine aggregate in concrete are obtained if the particles have the proper shape and proper gradation. The more cubical or rounded the particle, the more workable the concrete will be with a given amount of water in the concrete mixture. A lean concrete requires a finer sand than a rich concrete, and a favorable gradation for this purpose is possible with stone sand.

Fine stone sand with a larger proportion of dust also has given excellent results when used in mortar, and this offers a large market for the stone producer.

In the lean mixes generally used for concrete blocks and other masonry units, the use of stone screenings containing considerable dust has worked out very satisfactorily. Plasticity is imparted to the mix and denser and less porous blocks are obtained. Tests have shown that higher strengths result in lean mixtures by the addition of screenings containing fines up to 20 percent through the No. 100 sieve.

Agricultural limestone also offers a large market for fine screenings. Fine

dust becomes more immediately available as a neutralizing agent for acid soils than coarser grades, but the cost increases with the degree of fineness.

Other uses include the mixture of screenings with salt or calcium chloride in snow removal, as sub-ballast for railroads, and as fillers for paints, putty, linoleum, etc.

The foregoing indicates that quarry fines are not waste products, but are highly valuable materials with many uses which should be cultivated. In some cases, the installation of special processing equipment to produce fines may be found profitable.

Hydraulic Gypsum Plaster Development

HYDRAULIC GYPSUM PLASTER, which is relatively insoluble in water and will even set under water, has been made in recent years only in Germany, where it is known as Estrichgip or "flooring-gypsum," states a report of the U. S. Bureau of Mines. As the name implies, this material is used principally for floors, although to a lesser extent, and when blended with portland cement, it is likewise employed as outside stucco. It can be made into an excellent floor, but it sets slowly and requires considerable skill in manipulation.

Its good properties seemingly are due only partly to German technique in manufacture; a fortunate combination of accessory minerals or impurities peculiar to certain German deposits apparently is a further reason why hydraulic gypsum has failed elsewhere to be used in substantial amounts by modern builders.

Estrichgip is made by calcining at a high temperature, much higher than that employed for making ordinary plaster. Intermediate in character between Estrichgip and ordinary plaster are the well-known Keene's cements, which likewise are made at a relatively high temperature and which are modified in chemical composition by the deliberate addition of various salts or compounds as catalysts for promotion of set. Three companies in the United States produce Keene's cement, but the output in 1936 was only 32,167 tons, compared with a total of 1,730,687 tons of all kinds of calcined gypsum plasters and over 20,000,000 tons (112,396,000 bbl.) of portland cement.

New Hydraulic Cement

A new hydraulic cement, different from any hitherto known and possessing extraordinary properties, has been announced. R. S. Edwards, development engineer of the Rumford Chemical Co., described the patented material before a meeting of the A.S.T.M. Committee C-11.

Steps in the process include, first, mixing ground raw gypsum (through 80-mesh) with not more than two percent of phosphoric acid and sodium phosphate and adding silica (or a silicate) if the rock itself is not sufficiently siliceous; second, forming the mixture into pellets in a tumbling drum; and third, calcining at 1800 deg. to 2300 deg. F. in a tunnel kiln. Whereas ordinary gypsum is so soft that it can be scratched readily with the thumbnail, the resulting clinker is marble-hard and can be stored for an indefinite period without deterioration. The fourth and final step is to grind the calcined clinker exactly as is done with portland cement clinker, except that instead of adding a retarder the material is "catalyzed" with an accelerator, usually a mixture of potassium sulphate and zinc sulphate.

As explained to the Bureau of Mines, an inversion, or at least a volume change, occurs in the higher range of temperature reached in the furnace, forming a much denser product than ordinary calcined gypsum. The individual particles are coated with several of the higher alkaline phosphates, and this condition, too, exerts a marked effect on the behavior and properties of this interesting material.

Another factor is the elimination of free lime. Virtually all commercial gypsum contains carbonate lime, which is converted in the furnace to quicklime, which, in turn, promotes dissociation of calcium sulphate into sulphur gases and more lime. Even a few tenths of one percent of calcium carbonate in the original gypsum tends to accelerate grain growth in gypsum cements (unless properly treated) and thus prevent them from attaining their maximum strength.

Extraordinary strength is said to be an outstanding characteristic of the new gypsum cement. Whereas ordinary gypsum plasters and even portland cement have little tensile strength, especially in sanded mixtures, this new cement is said to sustain 600 to 1200 lb. p.s.i. in tension and has 10 times this strength in compression. Other claims for the new product are that it resists the weather with less expansion and contraction than portland cement, it is resistant to many acids, and will stand up under mechanical wear.

Illinois Gas and Oil Line Map

ILLINOIS, division of the State Geological Survey, has prepared an interesting oil and gas map of the state on which are shown all the oil and gas pipe lines, oil and gas fields, and undefined exploration areas. This map is of value to producers in the rock products industries as indicating sources of cheap fuel.

Selling Aged Lime Putty

(Continued from page 36)

The balance of the operations are the conventional process in a Brooks-Taylor lime putty plant. Lime is slaked in a one-ton batcher equipped with a recording thermometer to insure against "burning." The slaker discharges over a vibrating screen to a sump, from which it is pumped into one of the 2500-cu. ft. aging tanks. Excess water in the tanks is drained off through a patented sand filter identical with those described in other Brooks-Taylor plants. The normal procedure is to fill one of the tanks while the other is being drained for delivery. Putty is aged for at least nine days before shipment.

Transportation

Delivery of lime putty, or mortar, is made in Concrete Transport Mixer Co. open-top agitators on Ford trucks, which have a capacity of 1½-cu. yd. when used as mixers or 2-cu. yd. as agitators only. In delivering lime mortar, the charge of putty is first made in the agitator and sand is added from a nearby hopper.

Twenty-four truck mixers are operated between this plant and a ready-mixed concrete plant built late in 1936. Ten are of the open-top type described and the others are Blaw-Knox drum mixers of 2-cu. yd. and 3-cu. yd. mixer and agitator capacities, respectively, mounted on International trucks.

The mixing plant is a central mixed

concrete plant with a capacity of 50 to 60 cu. yd. of concrete per hour. The Blaw-Knox bins are loaded with a gantry crane and 1-cu. yd. clamshell, water is accurately weighed by a Neptune water meter, the mixes are weighed in Blaw-Knox weigh mixers, and concrete is mixed in a 2-cu. yd. Smith tilting mixer. Cement is handled either in bulk or in sacks.

Open New Lime-Putty Plant in Indianapolis

On June 15th the Heston lime-putty plant of the State Sand & Gravel Co., Indianapolis, Ind., officially started operations with about 25 local architects, contractors, and other prominent guests in attendance. Hayden Brooks slaked a few batches of lime on June 14th and broke in an operator who ran the slaker almost continuously throughout the day on June 15. A large number of visitors also came to see the plant on June 16.

It is a standard Brooks-Taylor two-tank unit. The plant at present is operated on pebble lime obtained from the Marblehead Lime Co. plant in South Chicago.

The State Sand & Gravel Co. operates a ready-mixed concrete plant located several miles from the lime plant. Originally the company planned to put the lime putty plant at the same location as the ready-mixed concrete plant, but

finally decided to locate it on the sand and gravel property at 2900 W. Minnesota St., Indianapolis, Ind. Ten mixer trucks are now operated, some of which will be used to deliver lime mortar.

James W. Hurt is president and W. L. Heston is general manager of the lime putty plant.

Lime Fertilizer

(Continued from page 30)

ample growth of grasses or legumes do not wash, erode or give up their rainfall as rapidly as bare land. Our urban dwellers, in our great river valleys, who have suffered so acutely in the past three years from floods, are never going to be satisfied to permit a recurrence of this suffering. Ample sod coverage in the water sheds will do more than any other single factor to prevent this difficulty. We in the plant-food industries have an opportunity to profit by this program.

Lime Is a Plant Food

While most of us appreciate the fact that lime in addition to being valuable as a soil corrective is also used as a direct plant food, the average farmer does not fully appreciate this. No greater single benefit is obtained from the so-called rapid soil tests than the ability to determine quickly the supply of available calcium and the supply of available magnesium. There are plenty of soils in this country of a satisfactory pH value that are still so deficient in available calcium and magnesium as to prohibit absolutely the successful growth of many lime-loving crops.

May I suggest that you urge all of your salesmen to emphasize in their talks both with their dealers and with the farmers, the importance of lime as a plant food, independent of its corrective value.

Preventive medicine is still in its infancy. Relatively little is known with respect to either the specific benefits to be obtained from an increase in the mineral contents of our vegetables, grains, milk and meat, but there is an ever increasing fund of knowledge which shows that ultimately the consumer is going to demand a higher mineral concentration in his food products, and there is no single element of greater importance in maintaining health, good teeth and the proper alkaline reserve in the system than his calcium. Health in crops like health in human beings depends upon proper balance. There is an opportunity second to none for these two great plant-food industries to go along hand in hand in the service of a greater and more profitable American agriculture.



New two-tank lime putty plant of State Sand and Gravel Co.

NATIONAL ASSOCIATION *Activities*

Crushed Stone

WM. M. ANDREWS, Union Limestone Co., New Castle, Penn., is national councillor for the National Crushed Stone Association on the board of the Chamber of Commerce of the United States, and he attended the recent meeting of the Chamber in Washington, D. C.

The May-June issue of the *Crushed Stone Journal* contains a reprint of a recent address by Thurman W. Arnold, new Assistant Attorney General of the United States on "Fair and Effective Use of Present Anti-trust Procedure," which will help members of the industry to understand the philosophy of the latest "trust-buster."

In the same issue A. T. Goldbeck, engineering director of the National Crushed Stone Association, has a helpful article on "The Use of Crushed Stone in Sidewalks for Highways." In this country where every other family owns a motor car, we have not paid much attention yet to providing sidewalks on highways for pedestrians. Maybe when the New Deal day of abundance arrives and every family has a car, more of us will take to walking for safety as well as exercise. Anyhow, there is no telling when a fad for hiking will reach sufficient proportions to create a demand for walkways.

Sand and Gravel

STANTON WALKER, director of engineering, National Sand and Gravel Association, has supplied members with a clear and concise method of determining proportions of materials required to produce concretes of different strengths. As a preliminary he states:

"The chief difficulty in designing for a specific strength, without the aid of laboratory strength tests, comes from the wide range in the strength-producing properties of different cements. Further, of course, no design for strength should ever be made which contemplates 'guaranteeing' the strength of field cured specimens. All such designs should be based on laboratory curing. Because of differences in temperature and curing conditions in the field, there is no necessary direct relation (particularly at early ages) between the strength of concrete in the job and that cured under laboratory conditions. However, strength tests of specimens cured under standard conditions (moist and at a temperature of 65 to 75 deg. F.) do

provide an accurate criterion of the potential strength of job concrete.

"A fault of most design methods which have been advanced is that they are either too technical or too detailed to be attractive to the average practical engineer who does not specialize in the design of concrete mixtures. Nevertheless, such engineers do feel the need, from time to time, for a simple procedure which will furnish an approximate idea of the strength that will be obtained for given proportions, or the proportions required to produce given strengths.

Mr. Walker then described a simple procedure. Referring to it in his letter, he said, "There is nothing new about it. It is based on well-understood principles and is used by a number of engineers. It does not take into account differences in grading of aggregate, except as to maximum size, but it does fit a wide range of aggregates with surprising accuracy."

Regarding progress in developing the Association's new laboratory at the University of Maryland, Mr. Walker says: "In addition to the part time assistance of Prof. George C. Ernst, we have engaged George Crum as laboratory assistant. Mr. Crum has had considerable laboratory experience, having worked for us from 1933 to 1936, and also in the laboratory of the Iowa and Minnesota State Highway Departments.

"The laboratory staff is, of course, sufficient only to carry on a limited amount of research work. However, our research activities have been started again and we are confidently looking forward to the time when they can be built up to the point where they are more nearly consistent with the needs of the members of the association. Our principal work thus far has been devoted to:

"(1) Getting the laboratory in working shape.

"(2) Investigating the resistance of aggregates to abrasion in the Los Angeles rattler.

"(3) Continuing our studies of accelerated soundness tests, with the view of determining suitable specification limits for a greater number of cycles than the usual five and of developing a better procedure for the conduct of the test.

"(4) Investigations in behalf of member companies which, for the most part, will yield information of general interest. There has been an unusual amount of such work.

"(5) Preliminary work in developing methods for the study of adhesion of bitumens to different aggregates.

"(6) General studies of the physical characteristics of different aggregates for the purpose of attempting to correlate such factors as soundness, resistance to abrasion, specific gravity, absorption, etc."

Mr. Walker presented a paper at the Fourteenth Annual Short Course in Highway Engineering, College Station, Texas, on April 15, on "Sand and Gravel in Bituminous Mixtures," a copy of which has been furnished members.

Ready Mixed Concrete

NATIONAL READY MIXED CONCRETE ASSOCIATION directors met in Pittsburgh, Penn., June 3 to discuss budget and finances for the fiscal year beginning July 1, to consider and act upon the reports of officers and to make plans for the 1939 convention. The scale of dues and budget for the ensuing year on the same basis as for the past year were adopted.

Subject to confirmation by the boards of directors of the National Sand and Gravel Association and the National Crushed Stone Association, the Netherland-Plaza Hotel, Cincinnati, Ohio, January 25, 26 and 27, 1939, were picked as the place and time of the next annual convention. The National Ready-Mixed Concrete Association sessions will be held concurrently with those of the National Sand and Gravel Association. The choice of time and place was restricted because of the desire of both associations to meet in the same city and as close in time as possible to the convention of the National Crushed Stone Association. The dates selected are Wednesday, Thursday and Friday—January 25 to 27. The National Crushed Stone Association convention will follow on Monday, Tuesday and Wednesday, January 30 to February 1. This arrangement was made primarily to assist the associate members of the three associations to hold a joint exhibit with the loss of the least possible time between conventions.

Stanton Walker, director of engineering of the association, described the present status of specifications and the work of the committees on standardization. He expressed the opinion that the association would eventually have to write a specification for mixer equipment which would include all types.

Consumption Data On Agricultural Lime

NATIONAL LIME ASSOCIATION (H. A. Huschke, manager, Agricultural Department) collects and sends to members annually a summary of the consumption of all agricultural liming materials by states. Also, a brief comparison of the significant trends has been prepared. They are given herewith.

The following table compares the consumption of different materials. It will be noted that the use of all types of liming materials showed an increase. (The Wisconsin figures for 1937 were based upon county agent reports which

Material	Tons used		Percent Increase
	1937	1936	
Ground limestone and screenings.....	5,772,588	5,567,432	3.7
Burned and hydrated lime.....	395,097	337,013	17.2
Marl.....	293,360	248,155	18.2
Miscellaneous materials.....	339,090	152,826	122.2
Totals.....	6,800,735	6,305,426	7.8

showed a terrific jump in the tonnage of miscellaneous materials during 1937 as compared with 1936.)

It is also of interest to note the relative liming activity in the different regions during 1937 as compared with 1936.

Region	Tons of all materials		Increase or decrease (Percent)
	1937	1936	
New England..	172,476	112,234	+ 53.7
Mid-Atlantic	1,036,709	729,239	+ 42.1
Mid-Western	4,519,281	4,928,935	- 8.3
Southern	1,035,356	492,940	+ 110.0
Western	36,913	42,078	+ 14.0

APPROXIMATE CONSUMPTION OF LIMING MATERIALS ON UNITED STATES FARMS DURING 1937

(Ton Basis)

Compiled by National Lime Association

State	Ground limestone	Limestone screenings and meal	Burned lime	Hydrated lime	Marl	Miscellaneous materials (6)	Total Liming materials	Effective lime oxides (7)	Lb. of lime oxides per acre of cropped land†
Maine (1)	33,075	—	900	4,000	—	—	37,975	20,102	27.7
New Hampshire (1)	14,140	—	250	1,800	100	—	16,290	8,592	37.1
Vermont (1)	21,800	100	1,200	7,000	2,000	1,900	34,000	18,812	33.2
Massachusetts (4)	34,522	—	—	5,271	—	248	40,041	21,075	67.5
Rhode Island (5)	3,000	—	50	1,850	—	160	5,060	2,917	74.8
Connecticut (1)	34,610	—	1,200	3,300	—	—	39,110	20,635	74.5
NEW ENGLAND	141,147	100	3,600	23,221	2,100	2,308	172,476	92,133	42.8
New York (4)	285,000	—	3,000	26,000	500	—	314,500	163,500	39.7
New Jersey (4)	32,084	—	559	40,869	—	9,362	82,874	49,806	94.3
Pennsylvania (4)	306,138	—	51,000*	87,731	2,150	19,988	467,007	268,900	67.1
Delaware (4)	2,514	—	4,052	9,900	—	364	16,830	11,813	46.9
Maryland (4)	31,151	—	35,628	37,546	3,643	8,851	116,819	78,389	75.2
West Virginia (2)	25,172	—	7,079*	1,895	3,141	1,392	38,670	22,197	23.6
MID-ATLANTIC	682,059	—	101,318	203,941	9,434	39,957	1,036,709	594,605	54.8
Ohio (4)	111,638	182,815	—	17,617	—	41,339	353,409	165,603	28.4
Indiana (2)	§	514,113	—	602	49,639	10,207	574,561	238,826	40.3
Illinois (2)	§	1,044,834	—	—	—	—	1,044,834	438,630	41.5
Kentucky (3)	§	734,411	8,851	—	76,170	—	819,432	342,635	99.6
Michigan (2)	5,446	68,836	—	4,829	140,000	—	219,111	84,014	17.5
Wisconsin (3)	§	400,000	—	—	—	200,000	600,000	268,000	50.3
Minnesota (2)	§	28,700	—	—	4,000	2,100	34,800	14,504	1.4
Iowa (3)	§	432,373	—	—	—	—	432,373	181,597	17.1
Kansas (3)	§	55,067	—	—	—	—	55,067	23,128	1.2
Missouri (3)	§	385,694	—	—	—	—	385,694	161,991	22.2
MID-WESTERN	117,084	3,846,843	8,851	23,018	269,809	253,646	4,519,281	1,919,128	23.1
Virginia (2)	233,951	900	10,690	9,643	6,953	27,751	299,878	150,533	59.5
North Carolina (2)	111,627	15,200	2,339	3,974	2,812	290	136,242	68,518	18.8
South Carolina (4)	53,695	2,800	—	298	354	—	57,147	28,409	10.8
Georgia (4)	19,769	3,000	—	393	—	1,170	24,332	12,004	2.3
Florida (4)	36,709	15,305	—	1,972	—	—	53,986	26,163	24.7
Tennessee (3)	§	413,910	—	—	—	—	413,910	173,842	45.0
Alabama (4)	35,417	10,250	—	104	—	—	45,771	22,086	5.3
Mississippi (4)	5,759	1,000	—	40	—	—	6,799	3,327	0.9
Louisiana (4)	6,241	1,000	—	50	—	—	7,291	3,575	1.5
SOUTHERN	503,188**	463,365	13,019	16,474	10,119	29,211	1,035,356	488,457	17.9
California (4)	1,469	—	—	475	1,548	12,329	15,821	8,006	1.8
Oregon (2)	9,290	1,063	—	100	—	1,739	12,192	6,031	2.9
Washington (5)	4,000	3,000	400	650	350	500	8,900	4,480	1.4
WESTERN	14,759	4,063	400	1,225	1,898	14,568	36,913	18,517	1.9
GRAND TOTALS	1,458,217	4,314,371	127,188	267,900	293,360	339,690	6,800,735	3,112,840	

STATES NOT LISTED USE LITTLE OR NO LIMING MATERIAL

- (1) Figures based on Agricultural Conservation Program records.
- (2) Figures partially estimated and partially obtained by county agent or producer survey.
- (3) Figures obtained by county agent survey.
- (4) Figures obtained by producer survey.
- (5) Figures estimated.
- (6) Consists of ground shells, by-product lime, etc.
- (7) Computed on the following basis: 50 percent for ground limestone, miscellaneous materials, and commercial marl; 35 percent for farm-dug marl; 42 percent for limestone screenings and meal; 70 percent for hydrated lime; and 85 percent for burned quicklime.
- * Includes an estimated 10,000 tons of burned lime used and distributed by local producers.
- ** Includes some ground limestone used in non-acid-forming fertilizer mixtures.
- § Some ground limestone probably included under "limestone screenings and meal."
- † Based on 1935 Census. Crop land—crop land harvested, crop failure, and idle or fallow land.



Directors of the National Crushed Stone Association at French Lick Springs, Ind. To the left, President T. I. Weston addressing the meeting

Crushed Stone Directors Meet to Discuss Legislation and Association

By NATHAN C. ROCKWOOD

TWENTY-TWO members of the board of directors of the National Crushed Stone Association and a dozen or more guests met June 16 at French Lick Springs, Ind., for their regular mid-year session. All business was completed in a single day and the rest of a two- and three-day (for some) session was devoted to renewing old friendships, which become more valued as years of work together roll by.

Next Annual Convention

The Netherland-Plaza hotel, Cincinnati, Ohio, January 30, 31 and February 1, 1939, were selected as the place and time of the next annual convention. This is the same selection made the last two years. The desire to hold the conventions of the National Crushed Stone Association and those of the National Sand and Gravel Association and the National Ready Mixed Concrete Association at the same place, as close together as possible, was the governing consideration.

The time and place of the 1940 convention were discussed and invitations from a number of cities considered, but no action was taken. It was the consensus of opinion that this was too early to make a decision, although it is getting increasingly difficult to find hotels which can take care of the three conventions as desired.

Officers' Reports

A. T. GOLDBECK, engineering director of the Association, gave an illustrated talk on recent developments, especially

designed to interest the Indiana producer guests who were present. His talk covered such items as the results of concrete road surveys, soundness tests of aggregate, shape of particles in crushed stone sand, some of the problems in bituminous construction, etc.—a kind of general resumé of the accomplishments of his division.

Mr. Goldbeck's regular mid-year report, which will be sent to members, brought the various activities of the engineering division up to date. Those of general interest are as follows:

Laboratory Research

"A number of special investigations have been conducted during the past several months as follows:

"(1) Investigation of comparative designs of bituminous surface treatments making use of different types of aggregates. This investigation was started at the instance of the producers in a certain State to determine if it would not be possible to have different designs for aggregates depending upon their Los Angeles rattler losses. This investigation has been completed successfully so far as giving us an answer to the problem concerned.

"(2) Tests on stone sand to determine the effect of shape of particle. These tests have resulted in the development of a technique for determining the proper shape of particle for use in stone sand as a fine aggregate in concrete and as a result of the test, a specification has been written to properly define the shape of particle.

"(3) Investigation of the effect of iron pyrites in stone sand on the durability of concrete. Most limestones contain a small amount of iron pyrites and since its presence has been questioned by some investigators, tests have been started to determine definitely whether it has harmful effects.—It has been stated that the sulphur in the iron sulphide or iron pyrites goes into combination with compounds in the cement to form calcium sulpho-aluminate crystals which have an expanding effect causing disruption of the concrete. This effect has not been definitely proven, but as the presence of iron sulphide in limestone has been criticized, it becomes important to obtain exact information on its effect.

"(4) Investigation of bituminous mixtures, making use of quarry wastes. The solution of this problem was requested by one of our members who had a large amount of quarry waste to dispose of. Some thirteen sections were tested in our circular track with the result that we were able to say definitely how to combine several different gradations of materials to the best advantage with the proper amount of asphalt so as to produce a stable and durable mix.

"(5) Special investigations on aggregates to determine the relative adhesion of asphalt. This question involved several different types of stone used in connection with bituminous macadam. The results showed somewhat better adhesion with a certain type of commercial stone as compared with another type of non-commercial stone.

"(6) Investigations to determine the effect of using dried aggregates in concrete. In a particular plant it seemed economical to use a drier in connection with the production of concrete aggregates and the question arose as to the effect of dried aggregate on the properties of concrete as compared with undried aggregate. Compression tests and tests for shrinkage were made and the results were not unfavorable to the dried aggregate.

"(7) Tests on a number of stone sands to determine the shape of particle in comparison with the suggested specification of 53 percent voids proposed to the State of Pennsylvania.

"(8) Permeability tests made on wickettes using stone sand mortar. This investigation was made for a particular company to determine if stone sand mortar showed better properties from the permeability standpoint than natural sand mortar.

"(9) Special tests on bulk specific gravity. In connection with studies of voids in stone sand, it became necessary to study very completely the variables which give incorrect results in making the voids determination, one of these being the method for determining bulk specific gravity. This study seemed essential in view of the apparent high importance of remedying the percentage of voids as a measurement for shape of particle.

"(10) Tests to determine the proper combination of stone screenings and clay for use in constructing a tennis court. The samples were submitted by a member company."

Other matters the association has been interested in are referred to in Mr. Goldbeck's report as follows:

Patent on Precoating Stone

"Our patent application regarding the precoating of stone for the prevention of stripping of asphalt in the presence of water is still pending. Whether we shall be ultimately successful in obtaining a patent it is impossible to say. The method covered by the patent application is exceedingly effective. In the meantime it is interesting to note that other efforts in this direction are taking form, principally in the direction of additions to the asphalt, and apparently some materials are quite efficient in changing the characteristics of the asphalt sufficiently to make it adhere to certain stones which otherwise release their bituminous film when acted upon by water.

"There seems to be no more important problem in the aggregate field than the question of durability of bituminous mixtures. Lack of durability can be traced too frequently to the inability of the asphalt to adhere to stone in the

presence of water. Our own solution of the problem, namely, precoating with hardened tar, is successful, but we can do little more with this method in the laboratory. It needs the development of a suitable method for application at the plant. We cannot go further without the cooperation of interested producers.

"The question of railroad ballast has become highly important during the past year or so. The railroads in certain cases have become more particular regarding the quality of stone which they will permit to be used on their main lines. We have investigated the use of vibration for the placing of ballast under the ties and the next step is to have this matter pursued by an interested railroad. The breaking up of ballast under the ties apparently is brought about more by the tamping methods used than from any other cause and if these methods could be revised, certain ballasts now rejected would in all probability be successful.

"Bituminous mixtures will need continuous investigation, first, to bring about better anti-skid qualities, and, second, to make them more durable.

"Investigations on concrete for highways by no means must be overlooked. Certain aggregates not now acceptable can be shown to be acceptable by the use of proper tests. The matter of durability of concrete highways is still very important and requires continuous investigation.

"Stone sand while well on the way toward more general acceptance, still needs more work to make it fully acceptable to the various agencies."

Report of the Administrative Director

J. R. BOYD, administrative director of the Association, summarized the status of legislation at Washington, with particular reference to last minute changes that were made in the Federal-Aid Act for highways, which reduced the projected appropriations for the fiscal year beginning July 1, 1940 to \$128,500,000 and the fiscal year beginning in 1941 to \$186,000,000, from the \$238,000,000 in 1938-39, which has been the figure established in the last few years.

Mr. Boyd also devoted some time to a discussion of the federal government's attack on the basing point price system as established in the cement industry. He did this in order to show that there was imminent danger that the same policy might soon be adopted toward other industries, particularly to the Agricultural Adjustment Administration's purchases of agricultural limestone.

OTHO M. GRAVES, past-president, reported on the dust control problem as faced by New York State crushed stone

producers. The industry is still very much puzzled because it is obvious to crushed-stone men that the law and regulations did not contemplate open quarry work but were evidently designed with underground tunnel work in New York City in mind.

The regulations arbitrarily split all rock "excavation" into two classes: (1) that having less than 10 percent of free silica; (2) that containing more than 10 percent. In the first case the air breathed by workmen may contain 100,000,000 particles of dust per cubic foot; in the second only 10,000,000 particles. Over these limits the operator must install "approved equipment" to reduce the dust count to these figures.

The state authorities are now proceeding to investigate dusts in other parts of the operation, and from dust counts already made dust concentrations in the air of crushing and screening plants are likely to run from 350 to 800 million particles per cubic foot, so that here the problem of abatement will be much more serious.

The only salvation of the industry, according to Mr. Graves, appears to be a better understanding of the situation all around, and eventually reasonable regulations, or reasonable interpretations of regulations, in the interests of all concerned.

Government Competition

The competition of WPA in the production and sale of crushed stone and agricultural limestone was discussed at some length by E. J. KRAUSE, A. J. RIGG and JOHN PRINCE. It would appear that the WPA itself does not engage in the purchase or leasing of equipment for crushing and screening stone, but the local sponsors of WPA projects take care of this (and often of themselves at the same time). Materials produced with this equipment and WPA labor is supposed to be used exclusively on WPA projects and not sold or given to cities, counties or private contractors for other work.

RUSSELL RAREY discussed the resolution prepared by the 1938 national convention of the Association requesting the Agricultural Adjustment Administration to adhere to f.o.b. destination prices in asking for bids on agricultural limestone. Up to this time this practice has been generally adhered to.

The meeting closed with the showing of two talking pictures produced by the National Association of Manufacturers for the purpose of selling industry to their employees and the public, and a moving picture "Stop Silicosis," produced by the federal Department of Labor, which seems to be designed to make the public sour on all employers in industry.

Dallas, Texas Operators Prove Royal Hosts At Sand and Gravel Directors' Meeting

By NATHAN C. ROCKWOOD

ONE of the most enjoyable summer meetings the directors of the National Sand and Gravel Association have ever held took place in Dallas, Tex., June 22 and 23. The Dallas producers headed by J. Rutledge Hill, president of the Association, were admirable hosts.

An entire morning session was devoted to a report by Stanton Walker, director of engineering and research, on activities in connection with the research foundation which has recently been established by the Association at the University of Maryland. This arrangement for original research work by Mr. Walker is proving very satisfactory to all concerned.

There has been a steady development in knowledge regarding the use of sand and gravel in bituminous road mixtures, to which the Association has largely contributed. One of the problems to be solved, according to Mr. Walker, is that of the adhesion of asphalt to aggregates, the lack of which in the presence of water is known as "stripping." In general silicious aggregates are more subject to stripping, but some silicious aggregates are not. Mr. Walker expressed the opinion that surface texture of aggregates was a far more important factor in bituminous road construction than shape of particle.

In bituminous highway construction Mr. Walker could see a trend toward the use of carefully graded plant mixtures, of relatively fine sizes. He had just returned from California where much experience in asphalt type roads is new and interesting. This field of activity is one of greatest interest to sand and gravel producers because of the large amount of this type of highway construction now being done and because crushed stone was formerly used for this type almost exclusively.

In the field of concrete aggregates far more attention has been paid to compressive and tensile strength tests of concrete than to fatigue and abrasion tests, although highway concrete usually fails from fatigue, or repeated loading, according to Mr. Walker. Practically no studies have been made comparing concrete made of various aggregates as to their ability to withstand fatigue and abrasion, and it is proposed that the National Sand and Gravel Association initiate such an investigation.

Mr. Walker is a member of the Joint Committee on Concrete and Reinforced Concrete of the various engineering societies which is writing a code to cover the selection of aggregates for concrete in fireproof construction. This code, of necessity, will make restrictions on the

use of silicious coarse aggregates.

V.P. Ahearn, executive secretary of the Association, reviewed in considerable detail the status of new and prospective federal legislation in so far as it would affect the sand and gravel industry. He particularly deprecated the changes that have been made in the federal-aid highway act. He did not believe anything would ever come of the several bills presented to the recent Congress for the construction of a system of superhighways.

The matter of selecting the date and place of the 1939 annual convention had been taken care of by the executive committee in cooperation with those of the National Crushed Stone Association and the National Ready-Mixed Concrete Association, so that the board of directors of the National Sand and Gravel Association merely endorsed the action of its executive committee without comment. The convention will be held at the Netherland-Plaza hotel, Cincinnati, Ohio, January 25, 26 and 27 (Wednesday, Thursday and Friday), coinciding with the convention of the National Ready-Mixed Concrete Association at the same hotel, and preceding the convention of the National Crushed Stone Association, which will also be at the same hotel as the other groups.



Directors of the National Sand and Gravel Association and guests who attended the meeting in Dallas, Texas

Windy Weather Demands Careful Handling of Heavy Objects



Fall From Roof Fatal

FALLS OF ONE SORT OR another continue to be the most frequent source of accidents in mills and quarries of the rock products industry. They are also among the most severe. A very large proportion result in permanent disabilities, many due to the breaking or crushing of feet, legs and pelvis bones.

A very unfortunate fatality recently resulted from a fall suffered by a carpenter foreman engaged in repairing a kiln room roof. The foreman, assisted by a helper, was busy attaching corrugated iron sheets, which were passed up to them as required from the staging just under the roof.

The helper received a 33-in. by 10-ft. corrugated sheet from an employe on the staging below, and passed it up to the foreman for placing. The helper offered to assist the foreman in turning the sheet end for end, but the latter preferred to handle it alone, saying that he could manage it all right.

At this moment a gust of wind caught the upturned sheet and threw the unfortunate foreman off balance. He dropped the sheet and grabbed for the roof channel but was unable to retain his grip. Fortunately, the hazardous sheet remained on the roof, but the foreman began his rapid descent, dropping between the roof members. His fall was checked momentarily as he fell on a number of abandoned electric wires supported on the under side of the roof trusses. These were unable to resist the force of his fall, breaking loose and allowing him to continue downward. Ends of the disengaged wires entangled the victim's legs with the result that he dropped head downward, striking the top of a kiln on head and shoulders. His fall continued until he reached the floor. The total distance fallen was about 36 ft. The top of the kiln is 15 ft. 3 in. above the floor.

The victim of this accident was a man 39 yrs. of age. At the time of his death he had been employed by the same employer 9 yrs. His accident record was clear and he was considered cautious and well accustomed to the hazards attached to roof repair work of this kind. The injuries suffered included compound fractures of the skull, fractured rib, ruptured heart and lacerations, death resulting in less than two hours. The victim left a widow and two children.

It seems quite obvious that faulty

planning of the job played a direct part in this accident. Would it not have been possible to pile the plates on the staging up and laid down in position on the roof without swinging them around through 180 degrees? If swinging of the plates could not have been avoided, could it not have been accomplished by the employe in the more protected position on the staging?

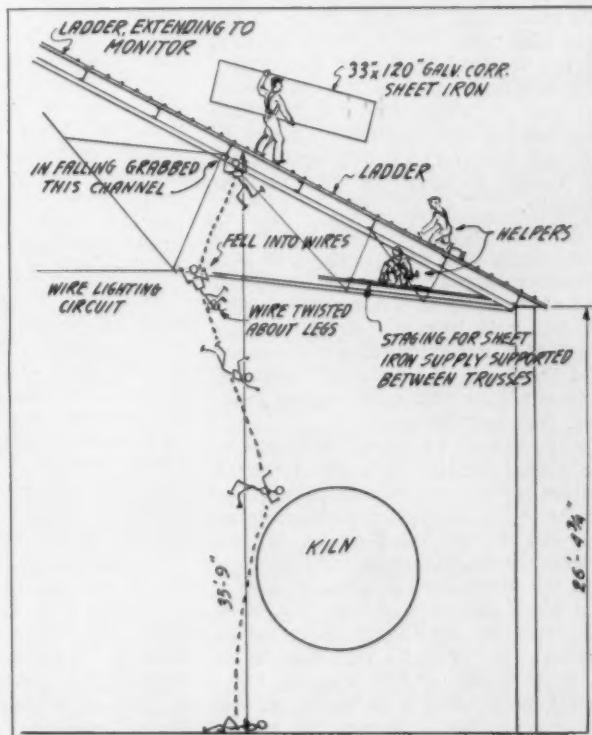
The accident occurred at 11:45 a.m. Wind velocity was officially recorded as 16 mi. per hr. at noon that day. With a wind blowing it would seem almost an unpardonable mistake to trust a corrugated sheet with an area of $27\frac{1}{2}$ sq. ft. in the hands of one man occupying an exposed position on the partly stripped roof. It is quite evident that this foreman overestimated his own ability in attempting to handle the plate alone. The pity of the situation was that he had with him a man who was ready and willing to assist.

The staging appears to have been properly constructed and supported. Possibly a guard might have been placed on top of the roof, although it is not so

easy to contrive a guard that would be practical as well as effective under such conditions. A life line to have been of any value, would have to have been handled by a helper; if a second man was needed on top the roof, as it appears he was, it would have been far more practical to have had him assist in handling the plates than merely to manage a life line while the other man did all of the lifting. With a helper on top, need for a life line would have been small.

The first warning sign of hazard in high overhead work exposed to the weather is *wind*. Wind imposes pressures, pushes and pulls at uncertain moments in uncertain directions and with varying and therefore uncertain intensity. Under such conditions men should estimate with great care and precaution their ability to control their own bodies as well as inanimate objects and make very ample allowances for sudden gusts. Where objects such as a rigid metal sheet are concerned, the hazard is immeasurably greater and the job either should be left until the wind abates, or the object should be securely lashed, or there should be plenty of help.

Diagram illustrating how a carpenter foreman met his death when he foolishly attempted to handle a large corrugated iron sheet in windy weather without assistance



Geology and Mineralogy for the Uninitiated

A Worm's-Jaw View of Dolomite

By JACK HAVARD
Mining Engineer, Denver, Colo.

ONCE UPON A TIME, there lived in the calcareous ooze of a shallow Silurian sea, a worm. And this worm was not a big worm, but it had great shiny jaws. And the jaws were very sharp with teeth, and very hard, and no doubt very fearsome to all the other small creatures of the ooze. And the worm, with his wormy brethren, lived his allotted time, and then died. And his great shiny jaws were his eternal tombstone. And that was millions of years ago. . . .

Many an ordinary limestone or dolomite conceals within its microscopic dimensions a realm of interest which is often unsuspected. Even the chemist, searching for CaO and MgO and CO₂, will lump the finest specimens of this museum together and label it, with appropriate profanity, "Insol."

Studying the Insoluble Residues

The so-called insoluble residues may contain minerals and fossils which not only have an important bearing upon the commercial value of the rock, but may also prove highly interesting even to the practical miner and quarryman. Too seldom, in fact, is the hard-boiled operator given opportunity to delve into the more-or-less scientific aspects of his rock, which lend it lithologic history or beauty or even its own peculiar glamour.

So, if you'll lay aside the burdens of cost sheets, time cycles, explosives performance, personnel, mechanical plant and other items of the operators' daily burden, we'll have a look at the "inside" of a not-extraordinary dolomite; and the result, if you haven't squinted around a little with a microscope yourself, may surprise you.

First, in case we sound too facetious, we should explain that the insoluble residue method has proven to be a scientific tool of increasing prominence in the last twelve years or so. It has branched from laboratory research work into the direct investigations of quarry and mine operators. Its use has been advocated and thoroughly explained in the technical press by such experts as H. S. McQueen, of the Missouri Geological Survey, and H. G. Martin, of the Indiana Geological Survey. To many,

such as the writer, who do not qualify as experts, the method has been a useful tool for some individual purpose and at the same time has revealed the very heart of the rock under investigation.

The basic procedure is simple. The basic limitation is that the rock should contain carbonates. Essentially, the usual routine is to dissolve the carbonates in 1-1 hydrochloric acid solution, and to study the remaining residue, under the microscope, after removal of silt and clay and proper drying.

Door County, Wis., Dolomite

The rock which underwent the particular investigation herein described is the Silurian dolomite of Door County, Wisconsin. (Door County consists of the northern part of that peninsula in Lake Michigan which has been termed "the thumb of the Wisconsin mitten," and also of Washington Island, Rock Island, Chambers Island and other smaller islands in the adjacent waters.) The rock is more familiarly known as the Niagara dolomite, but in its outcrop in northeastern Wisconsin it should be diplomatically called by the more general term until geologists settle some difficulties of nomenclature. It approaches closely the theoretical composition of dolomite as indicated by the following analysis: CaCO₃, 50.93 percent; MgCO₃, 43.56 percent; SiO₂ and insoluble, 3.40 percent; Fe₂O₃ and Al₂O₃, 1.29 percent; alkalies and organic matter, 1.05 percent.

This dolomite is quarried on a large scale at Sturgeon Bay in a modern electric-powered plant, and the rock, crushed to a variety of commercial grades, is shipped throughout the Great Lakes region as an aggregate stone. In its physical qualities it takes first place among Wisconsin dolomites and limestones in toughness, resistance to wear, crushing strength and resistance to weathering and chemical action.

Throughout its series of beds (from bottom to top, Mayville, Byron, Coral and Racine) in Door County, the Silurian dolomite varies greatly in its physical characteristics. It may be lamellar, thin-bedded, or massive blocky. In places it is highly porous and fossiliferous; elsewhere it is so fine-grained

as to be a semi-lithographic stone, with very little fossil material. Altogether, its unspectacular variety is one of its most engaging qualities.

The man who loves his stone—and most of us in the mineral industry do love our stone, despite our ready ire towards its troublesome peculiarities in our own pits and mines—will be thoroughly interested by the Silurian dolomite in its exposures in the high white bluffs on the Green Bay side of the Door County peninsula. Atop the cliffs, and often far back towards the Lake Michigan shore, one may stumble upon flat tables of dolomite, which have been smoothly scoured and deeply scratched by the same glaciers which also indented shore-lines, rounded contours, and covered hollows with soil and geologic debris. The former high levels of Glacial Lakes Nipissing and Algonquin are strikingly apparent in the benches, beach-lines and wave-cut caves which characterize the shores of the county.

Often the wanderer will find a stretch of rock floor along the beach where ancient ripple-marks have been exposed, telling a story of shallow-sea currents which disturbed the calcareous muds that, millions of years later, were to be quarried as Silurian dolomite. And, of course, from bottom to top of the cliff faces, and beautifully exposed by weathering in the farmers' fields, he will discover a vast assortment of fossils which will stir his imagination. . . .

Well, this is meandering a long way from insoluble residues and the worm's jaw view.

A study was made of the insoluble residues of the Silurian dolomites of Door County, Wisconsin, as part of a series of large-scale scientific investigations, the prime purposes of which were not commercial but nevertheless led to some interesting results from an economic viewpoint.

It has been explained in an earlier paragraph that the term *insoluble residue* as used in this investigation had a particular meaning. It refers to the material remaining after a dolomite or limestone has been dissolved in dilute hydrochloric acid and most of the clay and silt removed, usually by flocculation and decantation. The residue is generally a white powder to the naked eye, which under the microscope develops



Left: Photomicrograph of worm jaws taken from the Ellison Bay cliffs of Door County, Wis. Actual size is 0.50 to 0.75 mm. Center: Worm jaws from Eagle Bluff in the Silurian dolomite of Door County. Right: Photomicrograph of siliceous residues—a doloclastic form, a fossil remnant and crystals of quartz from the same formation

into a distinct collection of minerals and fossils, minute in size but often perfect in form.

Cliffs on the western shore provided the best sections for sampling the rocks. Samples were chipped from every distinct lithologic unit, and were taken on the average about three feet apart vertically.

In the laboratory procedure, the first step was a megascopic examination of the rock. Dilute hydrochloric acid was used to dissolve 25-gram, chipped samples. After solution of the carbonates, the clay and silt were flocculated with alternate hot and cold lake water, and then decanted. In a few cases the clay was either so large in quantity or so heavy that it could not be removed by this method and it remained in the residue. The insoluble residue which remained after this treatment was then washed out on a watch glass, dried and weighed. It was next examined under a binocular microscope in reflected light against a black field. Slides were made of some of the residues for detailed examination under a petrographic microscope.

The contained residues were, on the whole, small in amount. Approximately one-fourth of the 450 samples examined yielded less than 0.04 percent of residue (exclusive of the clay-silt section) and only about one-tenth of the samples yielded over 3 percent.

Under the binocular microscope, with maximum magnification of 30 diameters, the residues appeared largely as a collection of tiny white crystals, with many faces shining by reflected light.

Here and there some unusual mineral might catch the eye. The fossils were often prominent, varying from large silicified corals to the chitinous remains of worm's jaws—yes, here are those jaws again!

In general, the fossils in the insoluble residues fit into two main classes: those composed of chitin, a nitrogenous organic substance, and those composed chiefly of silica. The chitinous remnants are barely discernible to the naked eye, although some of the larger graptolite parts and worm jaws found at the bottom of one cliff were readily discernible when the rock slabs in which they occur were wet with water. Some of the larger siliceous fossils, such as corals, brachiopods and crinoids, may even be measured in feet or inches instead of fractions of inches. Many of the specimens can be classed, however, as micro-fossils.

With this rather long introduction we come, then, to worm jaws, the most surprising and unexpected feature of this insoluble residue analysis. So draw up your chairs, you limestone men, and look at this.

The limey muds from which this dolomite was originally formed abounded at certain periods with a variety of worm, whose chief interest to us is that it was equipped with a magnificent set of jaws (see illustrations). When these worms gave up their wormy ghosts and their soft bodies were duly removed, their tough chitinous jaws remained behind as picturesque and awe-inspiring tombstones.

The first worm jaw to appear was almost ignored under the preliminary

low magnifications, but when curiosity led to enlarging the shining fragment, the geologists were downright alarmed by the formidable array of teeth that pounced into view.

Usually the jaws are perfectly preserved, with the surface shining and lustrous. Occasionally they are found broken or not in good condition (monuments, no doubt, of worms that loved their sweets). The color of the jaws is usually a deep brown. The teeth may also be brown, but frequently are distinctly gold-colored (this being the natural color of the teeth, with no indication of any early Silurian inlay work by annelid dentists!).

The shapes are all similar, somewhat like a canoe in general form, with the teeth set along the keel and the inner side hollow. The teeth are fairly uniform in size, but some jaws have large tusk-like developments.

The jaws vary in size, but average from 0.5 to 0.75 mm. in length. They may occur singly in a sample, or they may occur in numbers. In one sample, too, they may differ widely in size and general appearance. This is probably due not only to the fact that different species may be present (in which case we can imagine ferocious civil war among such well-armed aboriginals), but also that each worm may have been equipped with several pairs of jaws. No attempt was made in this particular work to identify these jaws or to study differences, if any, among the worm jaws found at various horizons in the stratigraphic column. This is a problem for a specially trained paleontologist.

Incidentally, some interesting detailed studies have been published concerning worm jaws. One of them describes jaws from the same general formations in the outcrop in Canada (Hinde, George Jenning, "Annelid Jaws from the Cambro-Silurian, Silurian and Devonian Formations in Canada and from the Lower Carboniferous in Scotland." *Quat. Jour. Geol. Soc. Lond.*, Vol. 35, 1879, p. 370 et seq.).

In the Door County dolomites, discovery of the worm jaws occurred intermittently from the bottom of the Mayville to the top of the Upper Coral, and in some of these horizons they have wide geographic distribution.

Quartz and Other Residues

The bulk of the residues consisted of minerals—feldspar, quartz, limonite, iron sulphides, pseudomorphs (mould-filling imitations) of limonite after iron sulphide, mica, glauconite (perhaps), and a trace of the so-called "heavy minerals." Clay and chert were also found in large quantities.

Quartz is the most abundant of all minerals in the insoluble residues considered in this report. It occurs in a wide range of sizes, from barely visible particles under 0.02 mm. in diameter up to a millimeter and more in diameter. Almost invariably the quartz grains are irregular or rounded or ellipsoidal in shape. Interference color (under the petrographic microscope in polarized light) varies, of course, with thickness and orientation, but some grains give a banded extinction on rotation between crossed nicols; this is assumed to be evidence that the quartz is derived by sedimentary processes from rocks that underwent strain. The quartz was never noticed to be zoned. Some interesting, comparatively large, frosted grains of quartz proved to be of importance in marking certain horizons and helping in correlation between different sections.

Feldspar is the second most abundant mineral found in the insoluble residues. It occurs throughout the Silurian beds studied, but it becomes smaller in quantity in the Upper Coral and Racine. Most of the grains fall in the size range between 0.02 and 0.04 mm. in diameter.

Detailed universal-stage identification of the feldspar grains is necessary for complete identification. However, study under the petrographic microscope, at magnifications to 400 diameters, yielded data for the following description.

Apparently both plagioclase and microcline feldspar are present. The albite twinning consists of straight laminations of varying width. In some instances, however, there is indication of "wedging out" in this type when the stage is rotated between crossed nicols, and such a phenomenon points to the

probability that some of this laminated twinning is actually of the microcline variety. The microcline shows unmistakable grating structure, often in textbook perfection. In some cases both directions of twinning are distinct. Occasionally one direction is dominant, and twinning in the other direction is indicated by strong extinction bands moving across the grain on rotation of the stage.

Many of the feldspar crystals are "zoned." Usually there is a twinned, rounded inner zone, with an untwinned outer zone with only a fraction the thickness of the inner one. Grains without visible zoning are also numerous—often distinct sharp crystals in which no nucleus is visible.

The origin of this feldspar is a subject for speculation. One origin alone cannot explain the variety of forms here present. The rounded nuclei of zoned crystals and the comparatively few free grains of feldspar appear to be detrital—material which has been exposed to the same process of sedimentation that has rounded the accompanying grains of quartz. On the other hand, the sharp edges characterizing the outer layer of most zoned crystals, and also characterizing most of the small grains of unzoned crystalline feldspar, indicate authigenic growth—or growth within the rock, during or after lithification.

Limonite, a deep yellow to orange hydroxide of iron, was found widely through the residues—in shapeless masses, in tiny particles disseminated through clay, in round nodules, and occasionally in pseudomorphs, that curious form where the limonite has replaced another mineral but retained the exterior outline of the original.

Many residues were found to contain iron sulphides, crystallized in brilliant little forms as either pyrite or marcasite. Three beautiful bronze "spearheads" of marcasite were found in the Upper Coral beds—a mineralogist's treat.

Chert, a fibrous quartz, is found in sporadic occurrence from the bottom of the Mayville to the top of the exposed Racine. In the Byron beds it is almost entirely absent; in fact this one feature can be used for partial identification of the Byron. The chert occurs in all sizes and in varied forms, such as rough masses; dolocasts, or more properly "dolomoulds," which bear cavities reflecting the shape of dissolved crystals of dolomite; oölites, made up of several concentric shells, which may be found singly or in clusters, and a variety of silicified forms.

These silicified fossils occasionally show beautifully complete preservation of some ancient creature, but sometimes only a distorted and grotesque image was retained. There are both chain and

honeycomb coral, named for a distinct resemblance to the real things. Brachiopods, particularly the genus *Pentamerus*, are common—small clam-like shells in a variety of shapes and sizes. Cup corals of exquisite design are present. Sponge spicules, the fragments of a silicified stromatopore and some tentatively foraminifera were also found.

Incidentally, it may be mentioned that some attempts were made at correlation of various Door County geologic sections by means of these insoluble residues, and that the attempts were at least partially successful.

This study was made with the cooperation of the Geology Department of the University of Wisconsin as part of a large scale investigation of the Silurian and of the insoluble residue method. More detailed information is available there.

References

For further information on the insoluble residue method, the interested reader is referred to the following papers:

Burpee, G. E., and Wilgus, W. L.: "Insoluble Residue Methods and Their Application to Oil Exploitation Problems." *Mining and Metallurgy*, Vol. 16, p. 408, 1935.

Martin, Henry Garrett: "Insoluble Residue Studies of Mississippian Limestones in Indiana." Dept. of Conservation, Division of Geology, State of Indiana, Pub. No. 101, 1931.

McQueen, H. S.: "Insoluble Residues as a Guide in Stratigraphic Studies." Appendix I, 56th Annual Report, Missouri Bur. Geol. & Mines, 1931.

McQueen, H. S.: "Economic Application of the Insoluble Residue Method." *Trans. American Institute of Mining and Metallurgical Engineers*, Vol. 126, p. 530, 1937.

NATIONAL BUREAU OF STANDARDS, Washington, D. C., has published Research Paper R. P. 987, "Studies on a Portion of the System: $\text{CaO}-\text{Al}_2\text{O}_3-\text{Fe}_2\text{O}_3$," by Howard F. McMurdie. This is a continuation of phase-equilibrium studies on some of the oxides that occur in portland cement clinker.

JAPANESE CEMENT MANUFACTURERS are reported to have decided to utilize their surplus productive capacity to make steel, according to *Iron Age*. The Asano Cement Co. has decided to devote its newly released surplus electrical power, amounting to 1,000,000 kw.h. to the manufacture of electrolytic steels. Monthly production of 500 tons of steel ingot is planned. The Japan Cement Co. has decided to install steel manufacturing facilities at its Yashiro plant for the monthly production of 300 tons of steel ingots.

Comments on Thaddeus Merriman's Tests

THE PORTLAND CEMENT specifications of the Board of Water Supply of the City of New York, published in *Rock Products*, January, 1938, and testing methods used, described by Thaddeus Merriman, consulting engineer for the Board, in *Rock Products*, March, 1938, have aroused extraordinary interest in the industry. Herewith are some interesting comments from one reader:

A Discarded Method— Now Revived

Sir: The Board of Water Supply City of New York released a new specification for portland cement. The chemical tests conform to the United States Bureau of Reclamation Specification 566, the physical ones to the Standard Methods of A.S.T.M. The new specification, however, is distinguished by two original tests: (1) the test for alkalinity and free alkali content (Sect. 48.8), and (2) the sugar test (Sect. 48.10). These newly introduced tests obviously required a certain justification, hence Mr. Merriman, consulting engineer of the Board, published in the March issue of this journal (page 64) an explanatory article as to the reasons why these tests are required.

The writer takes the liberty to outline his opinion why these tests, especially the sugar solubility test, are unavailing and do not answer the purpose for which they are used.

The sugar test is to determine the presence of "free lime" in cement and, consequently, to show whether (1) "a cement has been so completely calcined that it will remain reasonably stable in the presence of water during the operation of mixing and placing concrete and, (2) whether it has been appreciably prehydrated."

The determination of uncombined lime by means of a sugar solution in water does not present an invention. This method was used by many investigators, chiefly in France, as far back as 50 years ago. Levoir (in the year 1886), Rebuffat, Leduc tried to apply sugar solutions for cement tests; Peligot, Petit, Lamy tabulated the solubility of lime in sugar solutions of various concentrations.

It is a completely established fact that no tests for uncombined lime in cement can be executed by means of aqueous solutions, because they hydrolyze a part of calcium compounds and liberate calcium hydroxide, thus increasing the eventual amount of uncombined lime. The solution of sugar in water is still more inadequate, because it decomposes cement, extracting

a considerable quantity of lime. The amount of extracted lime depends on the concentration of the sugar solution, on the duration of action, temperature, etc. This fact was proved by W. Michaelis¹ and by a number of other investigators. Therefore, all the current scientific methods for this purpose, beginning with W. E. Emley's, used in this country, and ending with the newest method by P. Schaeffer² and co-workers, are based on the absence of water. According to Mr. Merriman, however, the current tests are inadequate because of absence of water. The sugar test, in his opinion, determines whether a cement "has been so completely calcined, that in the presence of water it will not immediately begin to hydrate."

Inasmuch as the procedure of the specified sugar test includes a vigorous shaking of a mixture containing 15 grams of finely sifted cement and 100 cc. of a 15 percent solution of sugar in distilled water, during one hour and 50 min., I affirm that there is no such cement, which will not be hydrated and decomposed when treated in this manner. Naturally, under such conditions a part of calcium compounds will be decomposed and a considerable quantity of calcium hydrate set free. Thus the sugar method does not show whether the cement has been underburnt. The fact of underburning, however, can be established very simply by the determination of specific gravity.

The sugar method presents, according to Mr. Merriman, a quick and ready means for the determination of prehydration. The use of a reagent containing water (100 cc. of aqueous solution for 15 grams of cement) for the determination of prehydration is *a priori* futile. The fact of prehydration, however, can be easily and quickly established by the estimation of loss on ignition. A more exact determination can be found by the G. E. Bessey's calorimetric method.³

Consequently, the sugar solution, which decomposes cement, does not show whether the cement in the presence of water "will not immediately begin to hydrate." Actually, the finest cement grain begins to hydrate immediately after the addition of water. I agree that "the operations of mixing and placing concrete require time," but I disagree with Mr. Merriman that "all of the cement which hydrates before the concrete has been placed where the set can proceed in a quiet and orderly manner, is lost cement." The last postulation is a characteristic mixup of different phenomena such as hydration, setting and hardening. The standard test for setting, indicating the beginning of setting of neat cement, gives the engineer complete security regarding the time of mixing and placing.

The alkalinity and "free alkali" tests can give some indications as to the presence of alkali in cement. The writer prefers, however, the absolutely reliable analytical method for the exact estimation of alkali, inasmuch as the prescribed method is not so easy to be correctly executed, due to its rather primitive technique. Besides, the specified methods are in some respects imperfect. The following short consideration will illustrate this opinion.

The occurrence of "free alkali, i.e., as hydroxides is practically excluded, due to the manufacturing conditions. Only seldom, in exceptional cases, alkali may occur in the form of hydroxides. As a rule, they exist in chemical combination with the acid constituents of cement. The water treatment sets a part of the combined alkali free, therefore, the alkalinity test does not show a quite correct result as to the amount of "free alkali." On the other hand, the barium hydroxide test does not estimate the whole amount of combined alkali, because only the alkali combined with anions, forming insoluble compounds with Ba-cation, can be transformed into hydroxides and then estimated by titration with N/2 HCl. Thus, alkali chlorides, which under certain manufacturing conditions may occur in cement, cannot be detected by the specified $\text{Ba}(\text{OH})_2$ method.

Mr. Merriman states that the methods in discussion proved to be very useful when considering the qualities of cement.

I am convinced that this fact was purely accidental; the methods based on the use of water solution, in the cases discussed, do not and cannot give any reliable results.

GABRIEL A. ASHKENAZI.

New York City, April 24, 1938.

¹Tonind. Zeit. 33. (1909), p. 1334.

²Schweizer Archiv. II. December 1936.

³Builld. Research. Techn. Paper No. 9.

CALCINED MAGNESIA is now being produced from sea water bitters by a chemical process in a new plant of the Westvaco Chlorine Products Corp., at Newark, Calif. The first unit of the new plant has a capacity of 18,000 to 25,000 tons annually. Sea-water oxide or caustic calcined, two grades of periclase, and standard dead-burned magnesia are claimed to be equal or better than products made from either domestic or foreign magnesites. It is said that the new process products are free from impurities which cannot economically be freed from natural magnesites, and the process products can be changed in composition and uniformity by a simple chemical laboratory control.

LIME PRODUCERS' FORUM

Conducted by Victor J. Azbe, Contributing Editor, St. Louis, Mo.

Adapting Kilns to Burn Spalls

IN THE PREVIOUS article (May, 1938, pp. 57-59) was described the producer-gas fired kiln at the Peerless White Lime Co.'s plant, Ste. Genevieve, Mo., where much of my experimental work was done. After success in greatly increasing its capacity and efficiency, it was suggested that we adapt the kiln to the burning of spalls. The shaft width was just about right and so we were that much ahead.

First, a complex center burner was installed, then the side burners were properly arranged, a better top was put on the kiln and a fan was added capable of giving good draft. After completing the whole there were enough things wrong to justify quite a failure. The top was not nearly as tight as it should have been, which reduced the available draft greatly, the cooler was entirely too shallow; but in this case that could not be helped. The spalls were available, but they were in size ranging from a $\frac{1}{4}$ to 4 in. However, in spite of all this the kiln started out as an immediate success, capable of utilizing about 40 tons



Above: Illustrating size variations in spalls charged into the kiln. Below: Industrial cars loaded with small stone and regulation kiln stone

of spalls daily, making from these a rather good grade of lime.

Frankly, we all were surprised that it worked after seeing the state of packing the small lime would assume in the kiln. "Bud" Hunkins said it looked like a concrete wall, but still the combustible mixture disseminated satisfactorily and all of the lime was well burned except that occasionally one of the largest pieces would have a little core; but as a whole there was not more core, if as much, from this than any of the other kilns. If the stone had been properly sized through a reasonable range of say 1 to 3 in., there would have been no core.

That success was possible is due entirely to the center burner; and that for two entirely different reasons. The center burner made possible delivery of gas through the entire center section of the shaft. In addition it formed a wide ledge upon which lime would rest, permitting proper trimming of hot lime down into the cooler. Without the wide

*Abstract of a part of a paper read at the annual convention of the National Lime Association, Cincinnati, Ohio, May 10, 1938. The first half of the paper was published in ROCK PRODUCTS, May, 1938, pp. 57-59.

ledge and narrow free space to the wall everything would have been to no good purpose. When drawing, the partially burned lime in the cool sections, if not held back deliberately by the wide ledge, would have run into the cooler just like water, filling it with stone and leaving the lime above it.

Fig. 1 shows the most recent design of the center burner utilized, it now is far from the earlier crude attempts. Fig. 2 shows the center burner applied to the spall kilns, which also shows the side burners and other desirable features of a good kiln.

While in the case of the Peerless spall kiln much was not exactly as it should have been, this only proves that, if spalls can be burned in this manner, they certainly can be in a kiln specially built for the purpose. It seems that now there is no more reason for the tremendous piles of waste rock. It also seems that many of these existing piles may still be utilized.*

Instead of hand loading of rock there is to be a steam shovel, a crusher, a stone segregating system for lump lime, spall lime, and the smallest size can be ground for agricultural, or other purposes, or if necessary wasted. As there will be storage bins, the kilns can be of a type like the Paul Arizona kilns (Rock Products, May, 1938) small but capacious and charged with rock after every draw. The entire plant can be operated by a small, skilled, well paid crew.

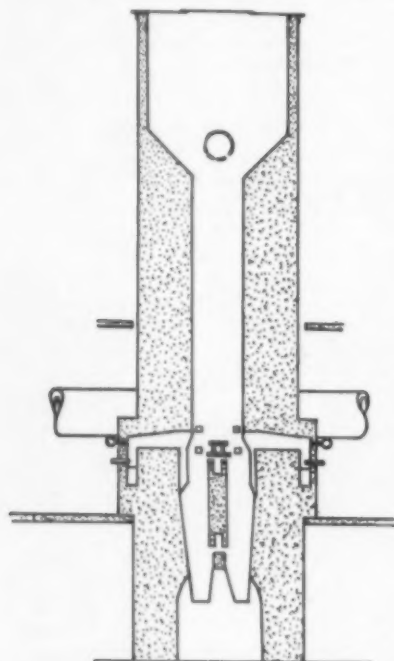


Fig. 1: Most recent design of the center burner used in Peerless kiln. Patents pending

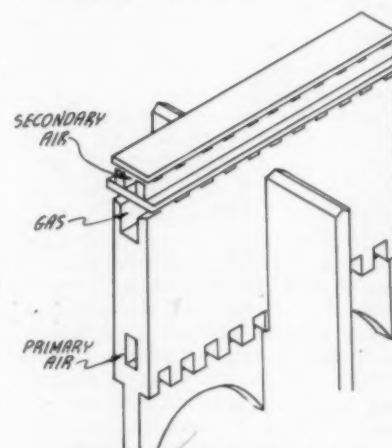


Fig. 2: Center burner applied to the spall kilns, showing side burners. Patents pending

Foreign Research Developments

By F. O. ANDEREGG

Consulting Specialist in Building Materials, Newark, Ohio

Hydrates of Calcium Ferrite—A research has been carried out at the Berlin Technical School by Helmuth Hofmann concerning the existence of hydrated calcium ferrites. Little of value seems to result by shaking together the hydroxides of the constituents, but when dicalcium ferrite is treated with water a solution is formed having 1060 mg. CaO per liter and two compounds were formed which were identified as $4\text{CaO} \cdot \text{SiO}_2 \cdot 7\text{H}_2\text{O}$ and $4\text{CaO} \cdot \text{SiO}_2 \cdot 14\text{H}_2\text{O}$ chemically and with the aid of X-rays. On treating tetra-calcium aluminoferrite with water the solution contains 640 mg. CaO per liter. Between these two limits another hydrated calcium ferrite is formed, which was not identified. Below the lower limit these compounds hydrolyze with the precipitation of ferric hydroxide. Monocalcium ferrite seems to be quite unreactive toward water or toward lime water. *Zement* (1936) 25, No. 39, p. 675; No. 40, p. 693; No. 41, p. 711.

The Testing of Natural Stones for Resistance to Frost and Weather—It is pointed out by Hans Breyer, connected with the testing of stones for the Imperial German Railways, that while the results of numerous cycles of freezing and thawing do give valuable information as to durability of a given stone, yet other factors enter into weather resistance. We lack adequate tests for these other factors so that the best present method of evaluation lies in adding to the results of freezing and thawing, observations as to actual weathering of stones from a given quarry and stratum. *Zement*. (1937) 26, No. 13, p. 202.

The Hardening of Magnesite Cement.—When properly burned magnesia is mixed with rather concentrated magnesium chloride solution, according to V. Rodt, the mass will set within a few hours to give a product having very good mechanical strength. Best evidence points to a dissolution of about 3 mol. of MgO to form a supersaturated solution from which the cement separates out slowly to form what appears to be an amorphous product under the microscope. With the aid of X-rays, however, fine crystals can be found to be present. The usual mix contains more than 7 mol. of MgO to one mol. of MgCl_2 , but the amount of water present is insufficient to change the whole of the mag-

nesium left to the hydroxide. If the MgO is prepared by low temperature burning from a precipitated carbonate, it is so distended that it never acquires appreciable strength, so it would seem that the presence of the unchanged MgO in the centers has an important function, just as the unhydrated centers of much of portland cement functions in space filling and as centers of strength.

The researches that have been made show that alcoholic extraction will probably eventually remove all the MgCl_2 and this leaching out is a serious defect in ordinary magnesite cement products. Another is the great tendency of the cements to absorb moisture from humid air, part of the chloride going into solution in this moisture. As high as 38 mol. of H_2O can be taken up by one mol. of the chloride in the cement. While it is possible to let water react with MgO to form a compact mass, the strength is too low to have commercial interest. (The addition of finely divided copper according to Hubbell, U. S. Patent 2,058,984, provides a means of using up excess chloride, or any formed by leaching, so that a great increase in water resistance is secured). *Zement* (1937) 26, No. 36, p. 597.

German Specifications for Building Lime.—These bear the official designation, "DIN E 1060 Baukalknormen." The limes are divided into two main classes: Air and water limes. The former include the "white" or high calcium, and dolomitic limes. Among the latter are grouped the hydraulic limes, the natural cements, including similar compositions artificially prepared, and Roman limes (formerly Roman cements). The white limes have a lower limit of 90 percent CaO and an upper limit of 5 MgO. Dolomitic limes have a minimum 90 percent CaO/MgO and more than 5 MgO. Hydraulic limes contain more than 5 percent soluble acidic constituent. When more than 5 percent MgO is present they are called, "dolomitic." They slake slowly but completely to a powder, and when properly handled are water resistant. The natural cements (called in these specifications, "Zementkalk") contain a minimum of 15 percent soluble acidic constituents, harden under water and are stronger than hydraulic limes. They only partially slake on adding water. Roman limes are produced from silicious stones and do not slake on adding water, so that they are ground at the

mill. In addition to the name, some indication must be given as to the slaking and hardening qualities of the material, also whether slaked or unslaked, if lime. Ground limes should leave not more than 5 percent on the 176 mesh sieve. The yield of limes varies within wide limits, the average for white being 11 liters putty from 5 kg. burned lime, 11 liters of powder from dolomitic lime and 7 of powder from hydraulic lime (3.5, 3.5 and 2.2 cu. ft. per 100 lb. burned lime). Each completely hydrated lime should be sound on hardening in the air. The water limes shall be sound when hardened under water. Strengths of limes hardened with the aid of carbon dioxide should reach 15 kg. per sq. cm. in 5 days (210 p.s.i.). The water limes hardened under water for 28 days shall have for compressive and tensile strengths, respectively: hydraulic limes, 210 and 42; natural cements, 280 and 56; artificial cement-limes, 420 and 70; and Roman limes, 840 and 168 p.s.i.

The yield is determined by hydrating in an excess of water, followed by standing in the air free from vibration until the first cracks appear, when the volume is measured. Soundness is determined on hydraulic lime, cement lime and Roman lime by making at least 10 pats of material gaged to normal consistency. After standing one day in the air, the first pat is immersed in water at 63 to 69 deg. F. If it shows after 24 hours of such storage any swelling, softening or cracks, the second pat, which had been stored one day longer in air, is immersed. The process is repeated until finally one specimen remains unaffected by this test. With hydraulic limes and cement limes, this steady state should be reached in 7 days and in one day with Roman lime. For lime to be sound it should show no effect after a 10-day air storage. *Tonindustrie Zeitung* (1937) 61, No. 58, p. 644; No. 59, p. 656; No. 60, p. 666.

QUARRY OPERATORS who have controversies with their neighbors over blasting and the alleged disreputable character of the quarry business in general can take heart in the fact that the late John D. Rockefeller, Sr., had a quarry and crushing plant on his exclusive estate, Forest Hill, Cleveland, Ohio. The existence of the quarry comes to light in the gift of the estate to East Cleveland for a public park by John D. Rockefeller, Jr. Mr. Rockefeller, Sr., evidently used the quarry to supply crushed stone for the driveways and paths of the estate. It is proposed to renew operation for the same purpose. The elder Mr. Rockefeller was evidently thrifty in small details as well as large ones, and was not above living in the neighborhood of a quarry.

HINTS AND HELPS FOR SUPERINTENDENTS

Economical Material Handling

IN THE ILLUSTRATION is shown how one west coast operator solved the problem of moving gravel to a crusher at



Drag scraper bucket being brought into position to pick up load of gravel pushed into its path

minimum cost. An Angledozer was mounted on a wide gauge RD7 Caterpillar which pushed the material into the path of the drag scraper bucket that carried the gravel up to the crusher hopper and dumped it. Nearly 64,000 cu.-yd. of gravel were moved to the crusher by this method.

Improved Quarry Cars

By N. W. TAYLOR
Morgantown, W. Va.

THE FEASIBILITY of constructing quarry cars depends upon the availability of usable parts from wrecking yards at reasonable cost.

End dump type cars may be constructed as follows: Trucks are secured from wrecked coal mine cars in some cases, and in others, trucks from saw mill carriages are used. The preference seems to be for saw mill trucks which offer reasonable strength with minimum weight. These trucks usually have an angle iron or channel steel frame, so the chassis is provided as a unit. Holes are drilled in the frame to which 2-in. planking is bolted to provide a solid deck over the frame. A block, 2-in. thick and 6-in. square, is spiked in the exact center of the deck or platform. A body is constructed for the car, in rectangular shape similar to any ordinary mine car or wagon box, with 1½ or

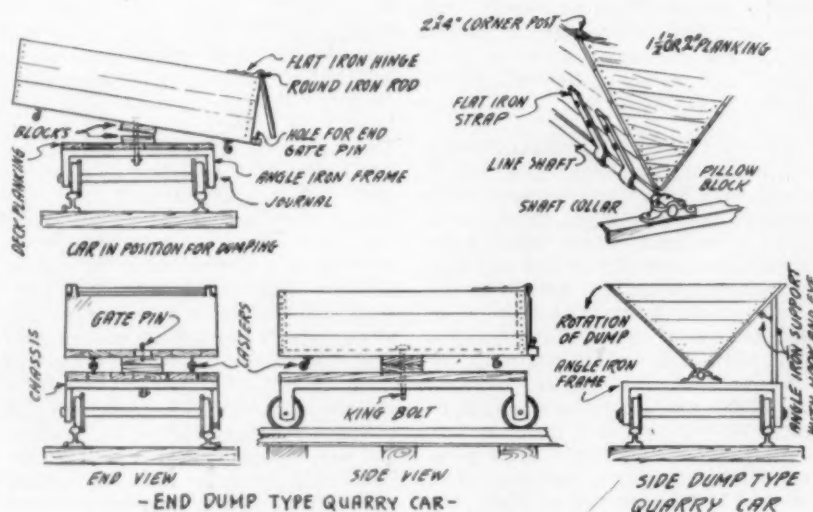
2-in. planking and 2- x 4-in. bottoms. A block 2-in. thick and 6-in. square is spiked in the exact center of the under side of the bottom planking, and located so that it is square with the block that has been attached to the car deck when

do not touch the deck of the chassis, due to the space provided by the 2-in. blocks in the center. Casters used for the bottom of a sliding door have been found serviceable.

A swinging end gate, using a battened plank end, is set in place with a round iron rod across the top on the outside. Two strips of strap iron are drilled and spiked to the top of the side walls. These flat straps are given a U bend to fit over the iron rod, the ends of the straps being spiked to the ends of the side walls. The end gate is held in place by a pin thrust through a hole bored in the end of the floor planking. A hook and eye at the end holds the body in position. Axle grease between the blocks at the king bolt permits easy turning.

When the car is to be dumped, the hook is detached and the car body revolved around on the deck. The casters prevent the car binding as they roll around on the deck, serving as a turntable. The end gate pin is pulled, and the bottom of the end gate swings out. The car can be easily tipped. Blocks, through which the king bolt has been placed, give enough space between the deck and the body to allow the body to tip at an angle when the body is turned crosswise, and the rock slides out easily.

The second type of mine or quarry car, makes use of the "V" type body and dumps to the side without any turntable. This type car is said to be



Construction details of two types of improvised mine or quarry cars

more easily constructed than the end dump type.

The framework (trucks and under-structure) are composed of cast-off coal mine or saw mill trucks. A V-shaped body, attached directly to the steel frame without decking, is constructed of 2-in. planking reinforced with battens. A pillow block, used to mount line shafts, is fastened on the exact center of the end member of the steel truck frame, holes being drilled in the frame to allow the pillow block to be bolted down. The other end is prepared in a like manner. A piece of shafting, the exact length of the car and of a diameter to fit the bearings, is put in place in the pillow blocks.

The body is mounted on the shaft with the point of the V resting on the shafting. A line shaft collar is attached to the shaft, inside the pillow block at each end and fitted flush against the pillow block, to prevent end movement or slipping of the shaft. The body is attached to the shaft by means of strap iron drilled so that it may be bolted to the planking of the car body and bent around the shaft to conform to the surface. Two vertical angle irons are bolted to one side of the car frame, and the body rests against these supports. A hook attached to each vertical support and corresponding eyes attached to the body, hold the body in position. Dumping is accomplished by dropping the hooks, allowing the body to revolve to one side. The difficulty experienced with this type car is usually in building the body too large in proportion to the weight of the trucks.

Bulldozer Aid for Hydrauliclicking

KLINKER SAND AND GRAVEL Co., Seattle, Wash., like others in that locality, makes use of hydraulic monitors and wood flumes to move sand and

with a lot of good material below grade. Various methods have been used to bring this below grade material to the pit end of the flume, but the one shown here is the most recent. The bulldozer pushes the material to the mouth of the



Using bulldozer to feed material into the range of jets of water to flume material to plant

gravel from the pit, or bank, to the plant. The disadvantage of this method is that it requires the flumes to be built to a considerable grade, and, therefore, they reach the top of the gravel deposit

flume. An Allis-Chalmers Model K tractor is the motive power.

Some operator may have a similar problem which may be solved by an adaptation of the methods described.



Pushing sand and gravel from the deposit into position so that it may be reached by the flumes which carry the material to the plant

Convert Second Aggregates Plant Into Concrete Batching Plant

Sand Recovery—With Plenty of Fines

By GEO. D. ROALFE
Contributing Editor, West Coast Activities

TWENTY-FIVE MILES south of the heart of Los Angeles the coast line is broken by a peninsula comprising 12,000 acres. The entire area is included in the Palos Verdes Hills, which attain a height of 700 ft. above sea level. Along the northerly slope occur deep deposits of bank sand. In common with other formations in this vicinity the hill structure is broken up with numerous faults. Due to these faults the relative elevations of the several strata vary in even closely adjoining areas. In some portions the sands are capped with diatomaceous earth and in others, lenses of calcareous conglomerate occur, often of considerable extent, which complicates commercial recovery of the sand. The deposits consist chiefly of silica sand, lacking almost entirely particles reclaimed on a No. 4 mesh screen and containing varying proportions of fossil shells and light shale particles.

The oldest continuous producer of concrete and plaster sands from these deposits is Edward Sidebotham and Son, Inc., of Wilmington, Calif. This company was organized by the late Edward Sidebotham, who with his son, Roy, designed and constructed the plant facilities. Their two adjoining properties are on opposite sides of a canyon through which runs a county road into the hills. Ordinarily they operate their original plant on the west side, but in times of peak market demand both plants have been run.

The original pit, which has produced the most of their sand, has a face of nearly 200 ft. Overburden has not been

a serious problem as it was extremely thin on the slopes. Usually it is handled by stripping operations utilizing a power shovel and truck to carry the



Batching plant with truck tunnel cement batcher in front, showing supporting I beam and aggregate batcher in shadow under bunker cement shed, to the left

spoil away from the operation. Such stripping is done in sufficient quantities to care for several months or a year at a time. While the principal production items are washed concrete sand and plaster sand, small percentages of 1-in. gravel and pea gravel are recovered.

Excavation is by means of a 3-cu. yd. drag bucket powered by a 150-hp., specially designed, double-drum Western hoist. In this hoist all drive pinions and gears are replaced with a multiple V-belt drive. This not only produces a quiet running unit, but has reduced starting and stopping shock to such an extent that the only repairs required in more than six years' use are the periodic replacement of brake linings. The hoist machinery is housed in a special corrugated iron building operated by remote control by a system of levers and rods from a housed operating platform nearly 50 ft. distant which overlooks the trap and has an unobstructed view of the entire pit.

The nature of the deposit, consisting chiefly of sand, permits close spacing of the grizzly bars over the recovery trap.

The trap is hopper-bottomed, and material is fed by means of a continuous feeder driven by a chain from the tail pulley of the bucket elevator into the buckets. Ten-inch buckets mounted on a rubber-covered belt are used for the elevator, which is 80 ft. between centers. The framing is of timber of standard construction.

All the processing machinery is mounted above the main bunkers. These have concrete supports and floor slabs. The superstructure is of the exterior stud and wailer type, and all bins have sloping bottoms to the gate openings. The main bunker has three bays with two pockets to each bay. Two of these bays (four pockets) are used for storing

Left: View of the original pit overlooking batching plant in foreground. Portion of the main plant to the extreme right; behind tree middle foreground, one of the water tanks immediately to right of cement shed beyond batching plant. Water settling basin in background, lower right-hand corner. Note horizontal strata dipping to foreground. Right: Batching plant, showing conveyors, settling basin and county highway leading to the north. Note strata dip in opposite direction to other pit, fault occurs between two plants



washed plaster sand, and one pocket each is used for washed gravel and waste. The plaster sand storage is 225 tons and washed gravel and waste 80 tons each. Adjoining the main bunker and at an angle with it is a small, one-bay bunker now not in use, and beyond this another two-bay bunker used for concrete sand storage. Both of these are of similar construction to the main bunker.

Processing

Raw material from the bucket elevator is discharged on the first of two V 17 Hum-mer screens. These are adapted for two decks, but as now used have only one deck. The first Hum-mer screen takes out the plaster sand, while the rejects are passed to the second screen. The troughs of the second screen are passed to a reciprocating drag rake washer, where the concrete sand is cleaned. The product of this washer is carried by belt conveyor to the concrete sand bunkers, or when being produced in surplus quantities, to a secondary belt which discharges into stockpile. The plaster sand produced can be placed directly in the bins below or transferred by belt conveyor to stockpile.

Rejects from the second Hum-mer, or concrete sand, screen are fed into a vertical pulsating jig similar to that used in concentrating metallic ores. This device has proved quite effective in removing soft and light particles from the gravel. The cleaned gravel and waste drop into separate storage bins below.

All units in this plant are driven by electric motors, using 440 volts, 3-phase, alternating current. Conveyor and other drives are by pulley and belt, which result in an unusually quiet plant.

The second plant, on the east side of the canyon is now in use as a batching plant only. It is, however, equipped to produce dry sand on short notice. The pit at this plant is more spotted and considerable quantities of conglomerate are encountered. When operated as a producing plant the recovery was accomplished by using a double-drum, gear-driven Western hoist and drag bucket. At present the trap is used as a receiving hopper for finished materials used in batching.

The plant itself consists of the trap fitted with a bar grizzly. From the trap an inclined belt conveyor runs to the top of a timber bunker. From here another belt conveyor runs to the top of the main bunker. This bunker has concrete footing, but the supports and floor system are constructed of timber. The separate bins have sloping sides. The belt conveyor discharges onto a Traylor magnetic vibrator screen, at present blanked with plate. When in



Pit at batching plant. Note change in stratification at right. This is the reverse of that indicated at north edge of same pit

operation as a producing plant, the products of the screen drop into four pockets arranged in two bays below, or to a stockpiling conveyor running towards the foot of the hill.

Batching Plant

In its present use as a batching plant the two main conveyors transport sized material to two of the four pockets in the main bunker. These two compartments are in the northerly bay of the bunker under which has been constructed a concrete lined and paved ramp. Adjoining the bunker and cornering with it is a corrugated-iron cement shed. The floor of the cement shed and the batching floor are on the same level, approximately 3 ft. 6 in. above ground level. Aggregates are proportioned with a Johnson Weighhopper, and a steel conical cement hopper is used for charging. Loading transit mixes is the principal use of the plant.

Both the aggregate and cement batchers are suspended in steel carriages having four wheels. These in turn run in the breast of two 10-in. I-beams.

The truck ramp slopes down for about

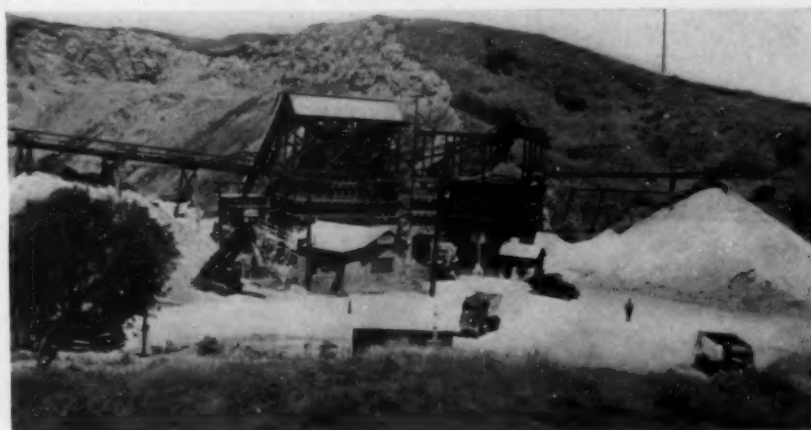
50 ft. and is open at one end only. The truck when in charging position is level with its top just above ground level. Alongside the cement batcher is installed a Crosby water meter for accurately measuring the mixing water fed to the truck. All units in this plant are motor driven through belt drives. Alternating, 220-volt, 3-phase equipment is used.

Deep-Well Water Supply

Water for these operations is obtained from a drilled well fitted with a Layne-Bowler four-stage, deep-well pump. Reserve storage of water is provided by two reinforced-concrete tanks located on the hillside above the batching plant. To supply water with uniform pressure, a Fairbanks-Morse centrifugal pump is used as a booster.

Recovery from stockpile is handled by the use of a Link-Belt loader, or with a crane or shovel. The company has at the pits a Lorain and a Northwest shovel, and a Northwest crane equipped with a clam-shell bucket. All shipping is by truck.

Main plant immediately in front of central bunker hoist house, concrete sand stockpile and bunker storage. To the right, plaster sand ground storage



TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week of June 18:

Central

54644. Establish on sand, naturally bonded moulding, in all kinds of equipment, C. L.; sand (except naturally bonded, moulding, ground or pulverized sand), in closed equipment, or in open top equipment with tarpaulin or other protective covering, C. L., from Rockwood, Mich., to Battle Creek, Bay City, 176c; Detroit, Ecorse, 99c; Grand Haven, 198c; Grand Rapids, 176c; Jackson, 143c; Monroe, 99c; Muskegon, 209c; Pt. Huron, 143c; Saginaw, 165c, and West Detroit, Mich., 99c per net ton.

54653. Establish on limestone, rough quarried, not suitable for building purposes, in open top cars only, Alexandria, Ind., to Duquesne, Pa., 200c net ton.

54662. Establish on (a) sand (except industrial) and gravel, in open top cars; (b) stone, crushed, slag and gravel, coated with oil, tar or asphaltum,* in open top cars, C. L., Belpre, O.

To	(a)	(b)
Friendly, W. Va.	99	113
Hannibal, Sta., W. Va.	99	113
Huntington, W. Va.	132	146
Sistersville, W. Va.	99	113
St. Marys, W. Va.	88	102
Salem, W. Va.	110	124
West Union, W. Va.	99	113
Pennsboro, W. Va.	99	113
Ripley, W. Va.	99	113
Ravenswood, W. Va.	88	102
Williamstown, W. Va.	66	80

Route—Via B. & O. direct.

54663. Establish on stone, fluxing, furnace or foundry, melting or refractory, unburnt, in bulk, C. L., Woodville, Gibsonburg, Bettsville, Maple Grove, O., to Valley Falls, R. I., 380c gross ton.

54664. Establish on agricultural limestone, unburnt, and agricultural limestone screenings, in open top cars, C. L., Woodville, Gibsonburg, Maple Grove, O., to Smithfield, O., 165c per net ton via P. R. R.—Alliance, O.—N. Y. C. R. R.

54668. Establish on stone, crushed (in bulk), and crushed stone screenings (in bulk), in open top cars, C. L., Holland, O., Pottsville, Archbold and Stryker, O., 50c net ton via N. Y. C. R. R. direct.

54689. Establish sand (except naturally bonded moulding, ground or pulverized sand) in open top equipment, C. L., Essex, Ill., to Indianapolis, Ind., 149c net ton.

54690. Establish sand, gravel and crushed stone, subject to usual description and min. wt., Keokuk, Ind., to Danes, New Waverly, W. Peru, Peru Junction, Menzie, Rich Valley, Hartman, Wabash, LaGro, Andrews Yard, Andrews, Huntington, Mardinis, Roanoke, Aboite, Prairie Switch and Hayden Road, Ind., 40c (on crushed stone); Peru, Ind., to Junction, Menzie, Rich Valley, Hartman, Wabash, LaGro, Andrews Yard, Andrews, Huntington, Mardinis, Roanoke, Aboite, Prairie Switch and Hayden Road, Ind., 35c (on sand and gravel); from Huntington, Ind., to Mardinis, Roanoke, Aboite, Prairie Switch and Hayden Road, Ind., 35c net ton (on crushed stone).

54692. Establish roofing granules, C. L., min. wt. 60,000 lb., Darlington, Penn., and Phalanx, O., to Cold Brook, N. B., 960c; Danville, 680c; Highlands, Mile End, Montreal, 580c, and Portneuf, Que., 830c; from Copley, O., to Cold Brook, N. B., 980c; Danville, 680c; Highlands, Mile End, Montreal, 600c, and Portneuf, Que., 850c per net ton.

54696. Establish sand and gravel in open top cars, C. L., Jackson, O., to Philo, O., 115c net ton (plus increase Ex Parte 123).

54700. Establish brucite and dolomite combined (calcined or dead burned), (see

Note 3), Nario, O., to various points in C. F. A. territory, rates on basis of 20 per cent of first class.

(Rates in Cents Per Net Ton)			
To (Rep.)	Prop.	To (Rep.)	Prop.
Ashland, Ky.	320	Huntington, W. Va.	320
Alliance, O.	240	Va.	320
Alliquippa, Penn.	300	Irvinton, Penn.	320
Alton, Ill.	420	Kokomo, Ind.	280
Bentley, O.	260	Lima, O.	180
Buffalo, N. Y.	340	Lockport, N. Y.	340
Butler, Penn.	300	Lorain, O.	180
Canton, O.	240	McKeesport, Penn.	300
Carnegie, Penn.	300	Middletown, O.	260
Chicago, Ill.	320	Midland, Penn.	300
Cleveland, O.	220	Milwaukee, Wis.	360
Columbus, O.	220	Newport, Ky.	280
Dearborn, Mich.	220	Peoria, Ill.	380
Detroit, Mich.	220	Pittsburgh, Penn.	300
Donora, Penn.	300	St. Louis, Mo.	420
E. St. Louis, Ill.	240	Sharon, Penn.	260
Erie, Penn.	280	Steubenville, O.	280
Ft. Wayne, Ind.	240	Vandergrift, Penn.	300
Glassport, Penn.	240	Wheeling, W. Va.	280
		Youngstown, O.	260

54705. Establish sand (other than industrial), in open top cars, C. L., and gravel in open top cars, C. L., Belpre, O., to Ohio points.

From Belpre, O.			
(Rates in Cents Per Net Ton)			
To (Rep.)	*Prop.	To (Rep.)	*Prop.
Nelsonville, O.	85	Torch Hill, O.	40
Middleport, O.	95	Athens, O.	60
Oreton, O.	95	Guyaville, O.	50
Millfield, O.	85	Stockport, O.	85
Chauncey, O.	80	Porterfield, O.	40
Glouster, O.	85	Zaleski, O.	80
Hobson, O.	95	Constitution, O.	40
Pomeroy, O.	95	Whipple, O.	70
Muskingum, O.	100		

*Subject to whatever increases are granted finally by the Ohio Commission.

54707. Amend Item 7540-F, C. F. A. L. Tariff 130-Y, rates based on table of equivalents on stone, crushed, slag or gravel, coated with oil, tar or asphaltum*, in open top equipment, C. L., from and to points in Ohio, providing for the addition of "Belpre, O." as an origin point therein.

54708. Establish slag, furnace (a product of iron and steel blast or open hearth furnaces), C. L., Black Rock, Buffalo (East Ferry St.), Buffalo (Louisiana St.), Buffalo (Maine St.), Buffalo Lake and East Buffalo, N. Y., to Meadville, Penn., 132c per net ton.

54715. Establish waste stone, viz., rip rap, breakwater, chips, grout and spauls, C. L., from Bedford-Bloomington, Ind., district to Decatur, Ill., 124c per net ton, via C. I. & L. Ry., Roachdale, Ind., B. & O. R. R.

54717. Establish on (a) sand, naturally bonded moulding, in all kinds of equipment, C. L.; sand (except naturally bonded moulding; ground or pulverized sand), in closed equipment, C. L.; (b) sand, ground or pulverized, in all kinds of equipment, C. L.; (c) gravel, in open top equipment, C. L.; sand (except naturally bonded moulding, ground or pulverized sand), in open top equipment, C. L.; Jackson, O. (Coalton, O. group), to Tremley, N. J. Descriptions (a) 385c, (b) 424c and (c) 385c per net ton.

54725. Establish on stone, rough, broken, min. wt. 36,000 lb., Castalia, O., to Babylon, N. Y., 29c; Franklin, Mass., 28c; Jamaica, N. Y., Newark, N. J., New York, N. Y., 27c; Southampton, N. Y., 21c; South Orange, N. J., 27c; Syracuse, 21c, and Utica, N. Y., 22c.

*Note—The oil, tar and/or asphaltum not to exceed 10% by weight of the commodity shipped, the shipper to so specify on shipping orders and bills of lading.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

54764. Establish on sand (except industrial) and gravel, in open cars, C. L., Zanesville, O., to Clarksburg, W. Va., 165c net ton, via B. & O. R. R. direct.

54835. Establish (a) Sand, naturally bonded, molding, in all kinds of equipment, C. L.; sand (except naturally bonded moulding; ground or pulverized sand), in closed equipment, C. L.; (b) Sand, ground or pulverized, in all kinds of equipment, C. L.; (c) Gravel, in open top equipment, C. L.; sand (except naturally bonded, molding; ground or pulverized sand), in open top equipment, C. L., Phalanx, O., to Josephstown, Penn.

(a) 132c; (b) 145c, and (c) 110c per net ton. (Includes Ex Parte 123 increase.)

54838. Establish crushed stone, chatt, slag, sand or gravel, coated with oil tar, asphalt and asphaltum, in open top cars,* Joliet, Ill., to Port Huron, 308c and Owosso, Mich., 257c per net ton.

54845. Establish on stone, crushed; slag or gravel, coated with oil, tar or asphaltum* in open top equipment, C. L., Indianapolis, Ind., to Brazil, 131c; Vincennes, 168c; Muncie, Frankfort, Columbus, 131c; Washington, 168c; Petersburg, 194c; New Castle, 131c; Lebanon, 118c; Seymour, Elwood, Crawfordville, 131c, and Anderson, Ind., 118c per net ton.

54853. Establish on brucite and dolomite combined (calcined or dead burned), C. L., min. wt. 60,000 lb., Maple Grove and Nario, O., to Atlanta, Ga., 34c; Fairfield, Ensley, 36c, and Alabama City, Ala., 35c; Cordele, Ga., 41c.

54877. Establish dicalcium phosphate, min. wt. 60,000 lb., Detroit, Mich., to Buffalo, N. Y., 24c.

Southern

16850. Gypsum, crude or crushed (not ground), C. L. Establish 21c cwt. from Plasterco and Saltville, Va., to Macon, Miss.

16860. Phosphate sand or clay, from Florida points to Southern territory. Amend S. F. T. B. Tariff 410-E, I. C. C. 259, to provide for a min. wt. of 72,000 lb. on phosphate sand or clay, in bulk or in bags, in closed cars (see Note 3). Bill of lading must be endorsed, "Car loaded to full visible capacity or to load limit," and agent should confirm this fact and so endorse the waybill.

16914. Change rating in Note B of Exceptions No. 17 to Southern Classification on shells, oyster, clam, or mussel, crushed or ground or not crushed or ground, L. C. L., from Class 10, to 5c cwt. higher than Class 10 in effect on March 27, 1938, resulting rate to be increased as per Table 1 of Tariff of Increased Rates and Charges No. X-123.

16937. Feldspar, crude, C. L., min. 80,000 lb. Establish 150c net ton, Martinsville, Va., to Brookneal, Va.

16947. Mica, crude or scrap, C. L., min. 80,000 lb. Establish 70c net ton. Boonford, N. C., to Johnson City, Tenn. Truck competitive. Expires Sept. 30, 1939.

16966. Limestone or marble, phospho-plaster; stone screenings or whitenstone, C. L. Cancel, as obsolete, rates published in Sou. Ry. I. C. C. A-10119 from Buque, N. C., Fletcher, N. C., Hot Springs, N. C., Pacolet, S. C., Spocari, Ala., to points in Sou. territory. Class or combination rates to apply.

16983. Fuller's earth, C. L. Establish rates from Aatapulgas, Ga., Jamieson, Midway, Quincy and Superior, Fla., to Beach Bottom, W. Va., the same as now published to Pittsburgh, Penn., and to Oakfield, N. Y., the same as now published to Rochester, N. Y., in S. A. L. Ry. I. C. C. A-17897.

Trunk

36772. Limestone, crude, furnace, fluxing or foundry, only when loaded in bulk in open top equipment, C. L. (see Note 3), from Stephens City, Va., to Richmond, Va., \$2.04 per net ton, in lieu of present 6th class rate 23c per 100 lb.

36786. (A) Lime, common, hydrated, quick or slaked; dry building mortar, C. L., min. wt. 30,000 lb.

(B) Lime, common, hydrated, quick or slaked, C. L., min. wt. 50,000 lb., to New Bloomfield, Penn., from Bellefonte and Pleasant Gap, Penn. (A) \$3.10 and (B) \$2.50; and from Campbell, Hellam and York Stations, Penn., (A) \$2.50 and (B) \$2 per net ton.

Sup. 1 to 36786. (A) Lime, common, hydrated, quick or slaked; dry building mortar, C. L., min. wt. 30,000 lb.; (B) lime, common, hydrated, quick or slaked, C. L., min. wt. 50,000 lb.; to New Bloomfield, Penn., (A) \$2.86 and (B) \$2.31 per net ton from Reading Company stations taking Group No. 1 and Group No. 2 as shown in Reading Company Tariff I. C. C. 1616, and (A) \$2.42 and (B) \$1.80 per net ton from Reading Company stations taking Group No. 3 of the same tariff; also from Martinsburg Group (A) \$3.08 (B) \$2.42; Bainbridge Group (A) \$2.20, (B) \$1.60; Chester Valley Group (A) \$2.86, (B) \$2.31; Buffalo, N. Y., (A) \$4.07, (B) \$3.30; Frederick Group (A) \$2.86, (B) \$2.31; Lebanon Group (A) \$2.42, (B) \$1.80; Ashcom Group (A) \$3.19, (B) \$2.53; Tyrone Group and Texas Group (A) \$2.86, (B) \$2.31 per net ton.

Sup. 2 to 36786. (A) Lime, common, hydrated, quick or slaked; dry building mortar, C. L., min. wt. 30,000 lb.; (B) lime, common, hydrated, quick or slaked, C. L., min. wt. 50,000 lb., from all Trunk Line lime producing points to New Bloomfield, Penn., rates on basis of formula used in the general lime adjustment under I. & S. Docket 4065, plus increase under Ex Parte No. 123, which is the basis employed for proposed rates under the original proposal and Sup. 1 thereto.

Sup. 3 to 36786. (A) Lime, common, hydrated, quick or slaked; dry building mortar, C. L., min. wt. 30,000 lb.; (B) lime, common, hydrated, quick or slaked, C. L., min. wt. 50,000 lb.; to stations on Susquehanna River and Western R. R. from Strasburg group; (A) \$3.30, (B) \$2.64, and from Staunton group; (A) \$3.63, and (B) \$2.86, per 2000 lb.

36864. Limestone, broken, crushed, ground or pulverized, C. L., min. wt. 60,000 lb., from Wingdale, N. Y., to:

	Rate net ton
Freeport, Me.	\$3.19
Brunswick, Me.	3.19
Pejepscot Mills, Me.	3.19
Deep Cut, Me.	3.19
Simpsons, Me.	3.19
Lisbon Falls, Me.	3.19
Lisbon, Me.	3.30

Reason—On basis of I. C. C. Docket 25220 scale.

36796. Asphalt filler, C. L., min. wt. 60,000 lb., from Castleton, Poultney, Vt., Granville and Middle Granville, N. Y., to various points in Trunk Line and New England territories, rates ranging from \$2.31 to \$3.63 per net ton.

36805. Gravel, sand, slag and stone, crushed, coated with oil, tar or asphaltum* in open top cars, C. L., (see Note 3), from Johnstown, Penn., to various stations on the B. & O. R. R., rates ranging from 80c to \$1.24 per net ton.

36806. Limestone, crude, when loaded in open top equipment, C. L. (see Note 3), from Linville, Va., to Covington, Va., \$1.49 per net ton, in lieu of present rate of \$1.71.

36831. Stone, crushed, coated with oil, tar or asphaltum,* in bulk in open top equipment, in straight carloads (see Note 3), from Pleasant Gap, Penn., to the following destinations in lieu of present sixth class rates (rates in cents per net ton):

To	
Brockport, Penn.	171
Carman, Penn.	180
Costello, Penn.	161
Coudersport, Penn.	171
Galeton, Penn.	171
Genesee, Penn.	180
Lewis Run, Penn.	188
Lushbaugh, Penn.	151
Newfield Jct., Penn.	171
Oswayo, Penn.	180
Russell City, Penn.	180
Rouletter, Penn.	171
Smethport, Penn.	180
West Bingham, Penn.	180
Westfield Jct., Penn.	180

Reason—Reflect Martinsburg or Tyrone Forge Scale for joint haul distances involved.

36810. To cancel carload commodity rates on sand, from Rome, N. Y., to C. N. Ry. destinations in Quebec, published under Items Nos. 3600 and 3605 of N. Y. C. R. R. Tariff I. C. C. No. 16481; also rates to C. P. Ry. points in Quebec, published under Item 2490, N. Y. C. R. R. Tariff I. C. C. N. Y. C. No. 16840 on sand common or building (other than blast, engine, fire, foundry glass, moulding or silica).

36840. Crushed stone, C. L., (see Note 3), from Bound Brook, N. J., to Clark's Summit, Penn., \$1.54 per net ton, in lieu of present commodity rate of \$3.30 per net ton. Reason—Reflects the joint Locomotive scale.

Western

E-41-247. Sand, core, loam or molding, C. L., min. wt. not involved, from Kirkwood and Merrimac, Wis., to Chicago, Ill. (connecting line deliveries). Rate: Present—154c net ton. Proposed—143c net ton.

Southwestern

13946. Fullers' Earth. To establish an import rate of 32c per 100 lb. from shipside New Orleans, La., and subports to Oklahoma City, Okla., on Fullers' Earth, carload min. wt. 40,000 lb.

14032. To establish a rate of 201c per ton of 2,000 lb. on gypsum rock, C. L. (see Note 3), but not less than 50,000 lb., from Acme, Tex. to Ada, Okla.

New England

44436. Feldspar, crude, min. wt. mkd. cap. of car, Cobalt, Conn., to Royersford, Philadelphia, Penn., Keasbeys and New Brunswick, N. J., 16; Buffalo, N. Y., 23; and Greensburg, Penn., 27. Present, class 21 as per Agent Van Ummersen's I. C. C. Nos. 316 and 160. Reason: To provide the same basis of rates from Cobalt as in effect from Portland, Conn.

44477. Crushed stone, min. wt. 40 net tons, except that when cars of lower capacity are furnished for carrier's convenience, the C. L. min. wt. will be the marked capacity of car, from Greenfield, Mass., to Readsboro, Vt. Present, \$1.60 net ton; proposed, \$1.10 net ton. Reason: To enable rail carriers to receive a haul on this material.

Exempt from Taxation

ON APRIL 5, a meeting was called in Columbus, Ohio, for all known Ohio ready-mixed concrete producers, to consider the Motor Vehicle Act amended by the last legislature—the ultimate outcome being a saving of license taxation fees, at least temporarily, for many producers within the state. And out of this meeting and others came the organization of the Ohio Ready Mixed Concrete Association.

At the April 5 meeting, a committee was appointed to meet with the state auditor to ascertain what could be done with reference to an opinion of the Attorney-General that the amended Motor Vehicle Act does not require ready mixed concrete units to display license plates.

The Attorney-General's opinion had been handed down when it was noted in the wording of the Motor Vehicle Act amended in the last legislature that ready mixed concrete trucks were excepted from being termed "motor vehicles."

The definition of "motor vehicle" in

the amended Act reads as follows: "Motor Vehicle" means any vehicle propelled or drawn by power other than muscular power or power collected from overhead electric trolley wires, except road rollers, traction engines, power shovels, power cranes and other equipment used in construction work and not designed for or employed in general highway transportation, well drilling machinery, ditch digging machinery, farm machinery, threshing machinery, hay baling machinery and agricultural tractors and machinery used in the production of horticultural, agricultural and vegetable products.

On March 31, 1938, the Attorney General in Opinion No. 2198 held in substance that "asphalt and tar distributors" and "cement mixers" came within the purview of "other equipment used in construction work and not designed for or employed in general highway construction" and are excepted from the legislative definition of "motor vehicle" and are, therefore, exempt from payment of the annual license plate tax.

At a subsequent meeting of the committee on April 12, a committee of three was appointed to confer with a Mr. Culbert of the Bureau of Motor Vehicles. The result of the conference was that the committee was instructed to notify ready mixed concrete producers to return their license plates with their registration certificates at once to the office of the Bureau of Motor Vehicles.

The Bureau of Motor Vehicles also on April 12 issued an order, in writing, directed to all police enforcement officials and deputy registrars, instructing them to recognize the operation of vehicles on which are mounted cement mixing units, as well as asphalt and tar spreading units, without license plates when such vehicles are used in construction work. This recognition by enforcement officers was written to be in effect until they were notified to the contrary.

The Attorney General's Opinion No. 2198 was given on March 31, 1938, one day before the deadline for procuring license plates. As a result, some of the ready mixed concrete producers, anticipating the Opinion, had delayed purchase of licenses and are now operating legally without license plates. Others are displaying tags and some have returned their plates with registration cards and have requested the return of license fee money paid out. The average license tag fee in Ohio state, based on the size of the truck mixer unit, is about \$250 annually.

This getting together of producers in a spirit of cooperation was the motivating factor in organization of the recently formed Ohio Ready Mixed Concrete Association.

Recent Quotations on Rock Products Securities

[illegible]

Quotations by ⁵¹A. E. White Co., San Francisco, Calif. ⁵²The Securities Co. of Milwaukee, Inc., Milwaukee, Wis. ⁵³Merrill, Turber & Co., Cleveland, Ohio. ⁵⁴Wise, Hobbs & Seaver, Inc., Boston, Mass. ⁵⁵Martin Judd Jr. and Co., San Francisco, Calif. ⁵⁶Neubitt, Thomson & Co., Ltd., Toronto, Ont. ⁵⁷First National Bank of Chicago, Chicago, Ill. ⁵⁸E. S. Ladin & Co., New York, N. Y. ⁵⁹Rogers & Tracy, Inc., Chicago, Ill. ⁶⁰Paul D. Sheeline & Co., Boston, Mass.

RECENT DIVIDENDS ANNOUNCED

California Art Tile, A.	\$.25	June 1
National Gypsum, 1st pfd. . .	Qu. 1.75	July 1
National Gypsum, 2nd pfd. . .	Qu. .25	July 1
Penn. Glass Sand Corp., pfd. .	Qu. 1.75	July 1
Yosemite P. C., 4% pfd.	Qu. .10	July 1

ARUNDEL CORP., Baltimore, Md., sand and gravel and dredging contractor, reported for the year ended December 31, 1937, a net profit of \$813,724 after depreciation, depletion, federal income taxes, etc., equivalent to \$1.68 a share on 483,851 shares of capital stock, excluding 8,705 shares held by the company. This compares with \$631,216 or \$1.30 a share in 1936.

Joseph V. Hogan, president, told stockholders that uncompleted contracts on company's books as of January 1, 1938, represented a value of \$7,185,543, which compares with \$8,366,779 as of January 1, 1937, and with \$6,216,461 as of January 1, 1936. Total construction work completed during the year amounted to \$11,294,699. He also said that sales of sand, gravel and stone during 1937 showed an increase of 15.13 percent, commercial slag showed a decrease of 21.85 percent and ready-mixed concrete showed an increase of 44.85 percent.

BASIC DOLOMITE, INC., Cleveland, Ohio, reports for quarter ended March 31, 1938, net loss of \$43,668 after taxes, depreciation, depletion and other deductions. Net operating loss of subsidiaries, not taken up, for first quarter of 1938 were approximately \$2400.

For year ended December 31, 1937, net profit was \$232,788 after depreciation, idle plant expense, interest, loss on sale of capital assets, federal income taxes and \$5000 surtax on undistributed profits, equal to 66c a share on 350,000 shares (par \$1) of capital stock. This compares with \$278,994 or 80c a share based on above shares in preceding year.

The New York Curb Exchange has approved the listing of 350,000 common shares of the company.

DOLESE & SHEPARD CO., Chicago, Ill., reports net loss of \$32,982 for the year 1937, compared with net income of \$39,902, equivalent to \$2.08 a share on the capital stock, in 1936. Reduced demands for crushed stone resulting from adverse conditions in the building industry and decreased governmental work were responsible for the decline, William Roy Carney, president, told stockholders in the annual report. Crushed stone sales in 1937 were 285,000 cu. yd. less than in 1936, and production was 307,000 cu. yd. less. Average selling price, however, was 28 percent over 1936, Mr. Carney said. Expenditures for renewals and additions to plant totaled \$34,000 in 1937. Since the

first of this year equipment-purchase notes in the amount of \$22,500 have been retired, and bank loans of \$25,000 were liquidated on March 1. Working capital declined from \$74,100 at the end of 1936 to \$51,049 as of December 31, last. Inventories increased from \$35,969 to \$45,265.

CONSOLIDATED ROCK PRODUCTS CO., Los Angeles, Calif., filed with the federal court a statement covering first quarter operations which shows consolidated net loss for the three months ended March 31, 1938, of \$61,055 after provision for bond interest, depletion, depreciation and amortization. This compares with consolidated net loss of \$37,403 for the corresponding period last year.

Charges for bond interest, depletion and depreciation are based on old valuations and do not take into consideration reduction of such charges provided in reorganization proceedings now awaiting approval by the federal court. Profit before interest, depletion, depreciation and amortization for the first 1938 quarter were listed at \$22,614, as compared with profit of \$54,701 on the same basis a year earlier.

Gross sales for the three months ended March 31, 1938, were listed at \$649,459, as compared with \$804,275 last year.

MARBLEHEAD LIME CO., Chicago, Ill., reported for the fiscal years ending November 30:

	1937	1936
Net sales	\$1,201,782	\$1,165,137
Cost of sales	980,502	950,140
Selling, administration and general expenses	140,079	129,355
Operating profit	81,201	85,641
Margin of profit	6.76%	7.35%
Other deductions (net)	4,364	13,157
Bond interest, etc.	28,471	29,902
Federal income tax	116,596	6,944
*Net profit	31,770	35,637
Earned per share, pfd.	\$9.26	\$10.39
Earned per share, com.	\$0.55	\$0.83
*After deducting \$69,722 (1936, \$65,074) depreciation and depletion and before crediting discount on bonds acquired, \$1,167 (1936, \$4,067).		
†Includes \$9,556 surtax.		

Current assets as of November 30, 1937, were \$347,701 and current liabilities \$238,572.

NORTH AMERICAN CEMENT CORP., Albany, N. Y., report for 12 months ending March 31, 1938, shows a net loss of \$685,543 after taxes, depreciation, depletion and interest, but before profit on bonds purchased, compared with net loss of \$232,175 for the 12 months ended March 31, 1937.

STANDARD SILICA CO., Chicago, Ill., reported for the year ended December 31, 1937, a net income of \$89,551, or 69c per share.

IDEAL CEMENT CO., Denver, Colo., reported for the years ended December 31:

	1937	1936
*Operating income	\$3,679,463	\$3,962,565
Other income	538,155	355,924
Total income	4,217,617	4,318,489
Federal taxes, etc.	806,459	925,453
Net income	3,411,158	3,393,036
Common dividends	3,182,247	3,322,465
Surplus for year	228,911	70,571
*After depreciation and depletion (1936, \$730,141).		

Current assets as of December 31, 1937, were \$8,880,183, and current liabilities \$940,839.

LONGHORN PORTLAND CEMENT CO., San Antonio, Tex., reported for the year ended December 31, 1937, a net income, after depreciation, depletion, federal income taxes, etc., \$309,656, equal to \$1.02 per share common, compared with \$279,078, or 88c per share, in 1936.

OREGON PORTLAND CEMENT CO., Portland, Ore., reported for the calendar year 1937, net income, after depreciation, depletion, taxes, etc., \$130,498, compared with \$153,864 for 1936.

PEERLESS CEMENT CORP., Detroit, Mich., reported for the years ended December 31:

	1937	1936
Operating profit	\$ 374,249	\$ 513,666
Depreciation	188,224	187,716
Net operating profit	186,025	325,950
Other income	30,517	20,743
Total income	216,542	346,693
Bond interest, etc.	76,722	87,110
Miscellaneous charges	28,115	25,973
Federal taxes		13,500
Net income	*111,705	220,110
Times interest earned	2.82	3.98
Earned per share	\$0.36	\$0.72
*Before crediting \$12,782 (1936, \$26,137) discount on bonds and other obligations acquired and \$944 miscellaneous adjustments.		

Notes: No provision for Federal surtax on undistributed profits in 1936.

No provision made for Federal income taxes in 1937 as allowable deductions appeared sufficient to eliminate taxable income.

Current assets as of December 31, 1937, were \$988,347 and current liabilities \$185,728.

MICHIGAN SILICA CO., Rockwood, Mich., reported for the years ended December 31:

	1937	1936
Net sales	\$ 218,691	\$ 228,910
*Net income	38,135	39,137
Earned per share, common	\$0.27	\$0.30
Number of common shares	140,000	115,000
*After Federal income taxes, etc.		

Current assets on December 31, 1937, were \$19,926, and current liabilities \$23,719.

SOUTHERN PHOSPHATE CORP., Baltimore, Md., reported a net income after depreciation, depletion, federal taxes, etc., for the year ended December 31, 1937, \$233,918, or \$1.03 per share common; against \$141,906 and 62c for 1936.

NEWS ABOUT PEOPLE

C. F. GRAVES has been appointed sales representative of Woodstock Slag Corp., Birmingham, Ala., for the State of Florida, according to an announcement by President George A. Mattison, Jr. Mr. Graves succeeds W. S. Hotchkiss who has been granted a leave of absence.

R. B. BROWNE has become director of sales promotion of the Pennsylvania-Dixie Cement Corp., with headquarters in New York City. Mr. Browne was for several years connected with the Lehigh Portland Cement Co., and, more recently, with the Certain-teed Products Corp., in an advertising and sales promotional capacity.

E. LESSLIE NEWBIGIN representing the David Mitchell Estate, lime manufacturers of West Australia, was a recent visitor in Rock Products' office. He attended the National Lime Association convention and plans to visit lime plants in this country and Great Britain.

FRANK L. CHRISTY has been elected president of the Marietta Concrete Corp., Marietta, W. V., succeeding Harry Helby. Mr. Helby has resigned to become associated with the Great Lakes Portland Cement Co., Buffalo, N. Y. Other officers are Frank J. McCauley, vice-president, and Charles D. Fogle, secretary and attorney.

H. D. HUMPHRIES has been appointed district engineer of the Portland Cement Association's Atlanta, Ga., office with supervision over the work in Georgia, Florida and South Carolina. Mr. Humphries, a graduate of the Georgia School of Technology, came to the Association in 1933 as a field engineer in Georgia, and in 1936 was appointed district engineer of the Richmond, Va., office. He succeeds J. M. Marshall, Jr., resigned.

J. E. DUNN has been appointed Portland Cement Association district engineer at Richmond, Va., with supervision of the Virginia-North Carolina territory. He succeeds H. D. Humphries who has been transferred to the Atlanta, Ga., office as district engineer.

J. E. JELICK represented the Portland Cement Association at a recent conference held in San Francisco to promote an Exposition Model Homes Tour in connection with the 1939 Fair.

ROY R. DREHER, assistant chief chemist, and Stanley Kozub, burner foreman, Universal Atlas Cement Co., Hudson, N. Y., were recently presented with 25-year service medals by Richard A. Dittmar, superintendent. The presentation was made in the presence of Paul Van Zandt, vice-president of the company, who was visiting the Hudson plant.

O. M. KNODE, president of the U. S. Gypsum Co., and M. S. Allison, works manager of the Sweetwater, Texas, plant, were recent visitors to the Eldorado, Okla., properties.

GORDON C. HUTH, for a number of years in charge of safety and related activities for the Universal Atlas Cement Co., Chicago, Ill., has resigned to accept a position in the industrial relations department of the U. S. Steel Corp. of Delaware with headquarters in Pittsburgh, Penn. He was at one



Gordon C. Huth

time located at Duluth, Minn. Mr. Huth is widely known for his activities as chairman of the Sub-Committee on Dust Problems, Committee on Accident Prevention of the Portland Cement Association.

A. L. MOSCRIP, recently superintendent of Moulding Brownell Co. quarries at Thornton, Ill., is now with the Construction Aggregates Co., producers of sand and gravel at Ferrysburg, Mich. Mr. Moscrip was formerly with the France Stone Co. of Ohio.

PAUL H. PRICE, State Geologist and Associate Professor, West Virginia University, has been appointed Professor and Head of the Department of Geology by the Board of Governors. He will continue as State Geologist.

GARNER A. BECKETT, president of Riverside Cement Co., Los Angeles, Calif., presided at one of the sessions of the recent Pacific Coast Manufacturers' conference of the National Association of Manufacturers held in San Francisco, Calif.

A. T. GOLDBECK, engineering director, National Crushed Stone Association, Washington, D. C., and W. C. HANNA, chief chemist and chemical engineer, California Portland Cement Co., Colton, Calif., are veteran members of the American Society for Testing Materials whose biographies were recently published in the ASTM Bulletin. The society is publishing a series of biographical sketches of prominent long-time members.

JOHN NORVIG is the new general superintendent of Penn-Dixie Cement Co., Nazareth, Penn., and will have charge of engineering and operation of the company's eight plants. Mr. Norvig was formerly superintendent of the Hudson, N. Y., plant of Lone Star Cement Corp., with which he had been associated for 14 years. He was formerly chief engineer of the International Cement Corp., a predecessor of Lone Star.

R. J. SUTHERLAND, superintendent of the Spocari, Ala., plant of Lone Star Cement Corp., has succeeded John Norvig as superintendent of the Hudson, N. Y., plant. Mr. Sutherland was formerly superintendent of the Trinity Portland Cement Co., Dallas, Texas, and later assistant superintendent of the Lone Star plant at Nazareth, Penn.

JOHN D. KLING and JOHN SHERWIN, Jr., are the two new directors of the Kelley Island Lime and Transport Co., Cleveland, Ohio, recently elected to the Board. Mr. Kling is a director of the Cleveland Building Supply Co., and manager of the company's Metropolitan Concrete Division, and Mr. Sherwin is a vice-president of the Cleveland Trust Co.

ARTHUR P. VAN SCHAIK, vice-president in charge of sales of the American Chain & Cable Co., Inc., Wilkes-Barre, Penn., died on June 7, while traveling from New Orleans to Chicago, en route to his home at Southport, Conn. He was a director of the American Chain & Cable Co., Inc., and also a director of the Chain Institute.

Obituaries

C. N. WINDECKER, who held prominent offices with various rock products companies, died June 1 at the age of 68. Mr. Windecker was vice president in charge of manufacturing at the Diamond Alkali Co., plant at Fairport, Ohio, when he retired two years ago. He also had been president of Thunder Bay Quarries Co., Alpena, Mich., and vice-president of the Standard Portland Cement Co., Painesville, Ohio. Mr. Windecker was associated with these enterprises from their very beginning.

CHARLES D. GRIFFIN, plant engineer of the Southern Sand & Gravel Co., Columbus, Miss., died on June 1 as a result of a heart attack. Mr. Griffin had been associated with the industry for about 20 years and was well-known throughout the state. He had been with the Southern Sand & Gravel Co. since its organization in 1929.

HARRY O. COLE, for 13 years plant manager for the Marquette Cement Manufacturing Co., at Cape Girardeau, Mo., died recently at the age of 52. Mr. Cole started with the cement company in 1907 as shipping clerk at the La Salle, Ill., plant.

AUGUST W. SCHMIDT, JR., head of the Standard Cement Block Co., New York, N. Y., died June 3 following a stroke. Mr. Schmidt was 53 years old.

EDWARD N. HINES, highway commissioner of Wayne County, Michigan, for over 30 years and reputed to be the "father" of concrete roads, died June 4 in Detroit, Mich.

JOHN F. DEELY, president of the Lee Lime Corp., Lee, Mass., died recently at the age of 74, following an operation.

LEW L. ALLER, president of the Ohio Sand & Gravel Co., Columbus, Ohio, died recently following a three-months' illness. He was widely known throughout the industry as a contractor and for his hobby of raising and training harness horses.

W. HOWARD EASON, cement company representative and receiver for the Harvey Steel Products Corps., Jackson, Tenn., is dead.

HURD KNOX, well-known in the asbestos industry, died at the age of 51 following a heart attack. Mr. Knox was superintendent of the Carolina Asbestos Co., Davidson, N. C. His first connection with the industry was with the General

Asbestos and Rubber Co., Charleston, S. C., and later he became associated with the Southern Asbestos Co., Charlotte, N. C.

H. E. CARNEY, SR., president of The Carney Co., Mankato, Minn., and at one time a prominent figure in the cement industry, died at Pasadena, Calif.



H. E. Carney, Sr.

where he had been living for the past 15 years on account of ill health. With his father, Patrick H. Carney, he started the manufacture of hydraulic cement under the firm name of Mankato Cement Works. In 1901, H. E. Carney took over active management of the plant, and in 1914 a new corporation was formed under the firm name of Carney Cement Co. In 1922, the firm name was changed to The Carney Co.

Accident Insurance

TEXAS PRODUCERS of crushed stone and sand and gravel, through their State Association, have appealed to the Texas Compensation Insurance Board at Austin for a division in considering and establishing different rates of insurance for accidents to employees sustained at permanent and at portable plant operations. Established producers feel that unless some consideration is given to the fact that there are permanent and portable plants, concerns of long standing which have trained employees will be penalized for accidents sustained at portable plants, where employees are not as skilled and are more prone to accidents.

UNIVERSAL CONCRETE PIPE CO., Columbus, Ohio, has purchased the Yancey Concrete Products Co.

Wins Silicosis Suit

DOLESE AND SHEPARD CO., Chicago, Ill., operator of a large crushed limestone plant at McCook, Ill., was declared the winner in a suit filed against it before the Industrial Commission of Illinois by an employee who charged disability because of silicosis. Arbitrator Charles A. Daly, in his finding on May 18, ruled that in light of the evidence submitted the petitioner could not recover compensation.

His finding was based on medical records, including X-rays, and on the time sheet record of the company which revealed that the employee had not been working in a dusty atmosphere the required minimum of 60 days (for siliceous dusts) since present legislation was enacted.

The plaintiff, in his testimony, claimed that he was unable to work after November 4, 1937, and that he was afflicted with shortness of breath, weakness, general disability and all the other symptoms of pneumoconiosis. His physician attempted to prove that X-rays disclosed a condition caused by dust in the lungs.

Actually the X-rays revealed a tubercular infection in the apex of the right lung, and the left lung was unaffected. In the testimony, Dr. T. C. McDougal, company physician, revealed that previous examinations had disclosed no condition in the man's lungs which could not be detected in anyone not engaged in industry. His X-ray plates did not disclose any nodulation or other evidence of damaged lung tissue other than the tubercular condition.

Upon cross-examination of the plaintiff's physician by the attorney for the insurance company representing the defendant, it was disclosed that the physician could not definitely distinguish between X-rays showing pneumoconiosis and tuberculosis. Fred F. James and Co., Chicago, Ill., insurance representative for the company, handled the case and Dr. H. E. Davis, Chicago X-ray specialist, testified as to his findings. Dr. Davis was called in as an expert some time ago to testify in the first four cases which were tried under the Indiana Occupational Disease Law. These cases were likewise won by the defendant.

LOUISIANA BOGANITE CORP. has been organized to develop fuller's earth deposits near Bogalusa, La. Mark P. Seirsdale of Bogalusa is president of the new concern; Philip J. Liauzza of New Orleans and Bascom D. Talley of Bogalusa are vice presidents, and Lachlan M. Vass of New Orleans is treasurer. Plans are being completed for the erection of a modern fuller's earth and clay processing plant at Bogalusa with a capacity of 240 tons daily.

Prices Bid—Contracts Let

WELLSVILLE, OHIO: Pittsburgh Gravel Co., Pittsburgh, Penn., was low bidder on 6000 tons of gravel to be used in construction of the local Ohio river flood wall. The bid price was \$1.40 per ton.

FAIRBURY, ILL.: Churchill Gravel Co., Pontiac, Ill., has the contract to furnish 8200 cu. yd. of gravel, at \$1.45 per cu. yd. delivered as designated, for highway construction in Forrest county. The gravel will be used in resurfacing some gravel road sections and in the construction of water bound surfacing.

SYRACUSE, N. Y.: Eldredge Sand and Gravel, Homer, N. Y., has been awarded a contract to furnish to the county 5885 tons of sand at \$1.35 per ton.

WELLSVILLE, OHIO: U. S. engineers have contracted with the Green Bag Cement Co. of Pennsylvania, Pittsburgh, Penn., for the delivery of 750 bbl. portland cement for use in the construction of a sea wall at Wellsville. The bid price was \$2.09 per bbl.

APPLETON, WIS.: Purchase of 2500 cu. yd. of crushed stone at 50c per cu. yd. delivered in the city has been recommended by the board of public works. The stone is part of an allotment of 5000 cu. yd. from the county on its farm to market program and may be used for street purposes.

WASHINGTON C. H., OHIO: County commissioners have awarded contracts, at competitive bidding, for 8300 tons of crushed stone to be placed on various roads in Fayette county during the summer. The bids contracts were awarded to C. C. Beam, Inc., Sugar Creek Stone Quarry and Blue Rock, Inc., at an average price of \$1.03 per ton.

GENOA, OHIO: County commissioners recently placed an order for 1000 tons of crushed stone with the France Stone Co., to be used for road purposes on Middle Bas and South Bass islands. The bid price was \$1.65 per ton delivered on the islands' docks plus 15c per ton dockage charge.

PHOENIX, ARIZ.: The procurement office of the federal treasury department has awarded contracts for 4000 bbl. of portland cement for use in highway construction work. The contracts were awarded at prices of from \$1.37 to \$1.82 per bbl. net, discounts included, f.o.b. plants, and were divided among the California Portland Cement Co., Colton, Calif., the Baker Thomas Lime and Cement Co., Phoenix, and Southwest-

ern Portland Cement Co., Los Angeles, Calif.

GRAND COULEE, WASH.: U. S. Treasury Department, procurement division, has requested bids for 5,800,000 bbl. of low heat cement to be used for completing construction of Grand Coulee dam.

WORCESTER, MASS.: Worcester Sand & Gravel Co. has been awarded the contract for run-of-bank gravel from Street Commissioner Herbert Green, City of Worcester, with a bid of 58c per cu. yd. John Pistara was given a contract for concrete sand with a bid of 70c per cu. yd., and also for screened gravel at the same price. The asphalt sand contract went to J. Fitzpatrick with a bid of 60c a cu. yd.

JEFFERSON, OHIO: Troyer Construction Co., Aurora, Ohio, received an order for 2000 cu. yd. of gravel from the county commissioners at a price of \$1.00 per cu. yd.

WASHINGTON, D. C.: Federal contracts have been awarded to the following cement companies: Monolith Portland Cement Co., Monolith, Calif., 250,000 bbl. low heat portland cement at \$1.63 per bbl. to be used at Los Angeles, Calif.; Oregon Portland Cement Co., Lime, Ore., 2500 bbl. sulphate-resisting cement at \$2.00 per bbl. to be used at Reedsport, Ore.; Union Portland Cement Co., Devils Slide, Utah, 2413 bbl. normal portland cement at \$2.60 per bbl. to be used in Ogden, Utah; Colorado Portland Cement Co., Portland, Colo., 2160 bbl. normal portland cement at \$2.25 per bbl. to be used at Fort Logan, Colo.; Monolith Portland Midwest Co., Laramie, Wyo., 35,000 bbl. sulphate-resisting cement at \$2.20 per bbl. in cloth bags with an allowance of 50c. per bbl. for returned sacks, to be used on the Shoshone project, Wyo.; Three Forks Portland Cement Co., Trident, Mont., 6000 bbl. finely-ground portland cement at \$2.50 per bbl. to be used on the Sun river project, Wyo.

W. W. BOXLEY AND CO., Pounding Mill, Va., plant, recently shot down 150,000 tons of limestone in one blast, enough to keep the plant in operation another year. A total of 70,000 lb. of explosives were used in 28 holes, ranging from 75 to 220 ft. in depth.

T. L. HERBERT AND SONS, Nashville, Tenn., is rebuilding one of its dredges on a new steel hull. The 12-in. pump is powered by a 3-cyl. Diesel engine and sizing will be done over a new Allis-Chalmers triple-deck 4- x 12-ft. low-head vibrating screen.

Cement Bids

PROCUREMENT DIVISION, U. S. Treasury, in continuing its centralized buying program for cement, asked for bids to be opened in Washington, D. C., June 13, for two lots of low heat portland cement to be used by the Bureau of Reclamation in the state of Washington. The bids totalled 7,800,000 bbl. with prices quoted f.o.b. cars or trucks at production point. One schedule covers 2,000,000 bbl. to be delivered between August, 1938, and June, 1939; the second 5,800,000 bbl. to be delivered between August, 1938, and October, 1941. Delivery schedules are not to exceed 15,000 bbl. daily or 400,000 bbl. per month. Eight bids were submitted on schedule No. 1 as follows: Beaver Portland Cement Co., Gold Hill, Ore., mill, 135,000 bbl. at \$1.50 per bbl.; Lehigh Portland Cement Co., Metaline Falls, Wash., mill, 250,000 bbl. at \$1.43 per bbl. (cars) or \$1.55 per bbl. (trucks); Northwestern Portland Cement Co., Grotto, Wash., mill, 200,000 bbl. at \$1.485 per bbl.; Olympic Portland Cement Co., Bellingham, Wash., mill, 600,000 bbl. at \$1.495 per bbl.; Oregon Portland Cement Co., Lime, Ore., mill, 150,000 bbl. at \$1.20 per bbl.; Santa Cruz Portland Cement Co., Davenport, Calif., mill, 300,000 bbl. at \$1.50 per bbl.; Spokane Portland Cement Co., Irvin, Wash., mill, 250,000 bbl. at \$1.70 per bbl.; Superior Portland Cement Co., Concrete, Wash., mill, 900,000 bbl. at \$1.415 per bbl. On schedule No. 2 six bids were submitted as follows: Lehigh Portland Cement Co., Metaline Falls, Wash., mill, 800,000 bbl. at \$1.43 per bbl. (cars) or \$1.55 per bbl. (trucks); Northwestern Portland Cement Co., Grotto, Wash., mill, 580,000 bbl. at \$1.485 per bbl.; Olympic Portland Cement Co., Bellingham, Wash., mill, 1,400,000 bbl. at \$1.495 per bbl.; Oregon Portland Cement Co., Lime, Ore., mill, 300,000 bbl. at \$1.20 per bbl.; Spokane Portland Cement Co., Irvin, Wash., mill, 725,000 bbl. at \$1.70 per bbl.; Superior Portland Cement Co., Concrete, Wash., mill, 2,400,000 bbl. at \$1.415 per bbl. The latter company offered to ship 300,000 bbl. from Seattle, Wash., on schedule No. 1 and 800,000 bbl. from Seattle on schedule No. 2.

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., has dismantled and moved its "hot rock" plant near Oakdale, Calif., to its River Rock plant near Livermore. R. L. Robinson, manager of the plant until March 1, will operate the 1200-acre sheep ranch of the Atlas-Olympia Co. of California, which owned the rock plant until it was purchased by Pacific Coast Aggregates, Inc.

Concrete Products

Cement Products

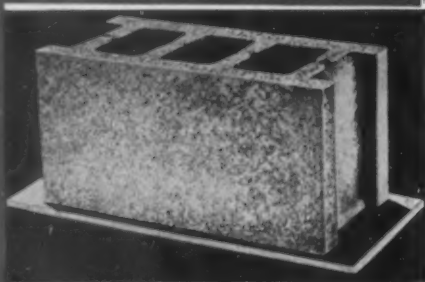
TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Attractive Interiors In Concrete



Living room of concrete house built by Lexington Concrete Products Co., Lexington, Ky. Features include light-weight, precast concrete walls and exposed concrete joists, and 24-in. square mottled brown load-bearing concrete floor tile superimposed on concrete joists

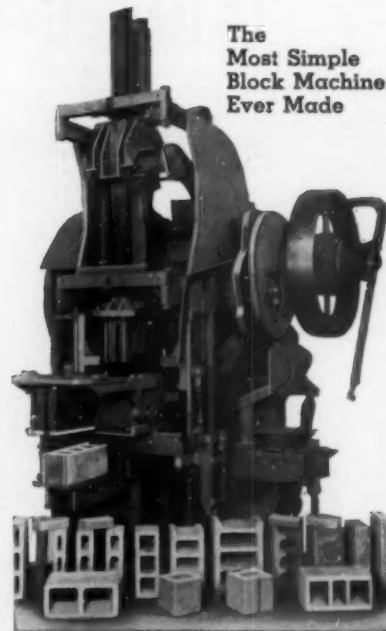
WHY THE USE OF CONCRETE MASONRY UNITS IS INCREASING



Improvement in quality and appearance has brought concrete masonry units into popular demand for above ground and exposed wall construction. FULLY PRESSED TOP units are specified in the finest residences because of their attractive appearance. The low cost of these units make them popular for smaller houses where the best for the money is desired.



A beautiful home of Concrete Masonry near Allentown, Pa.

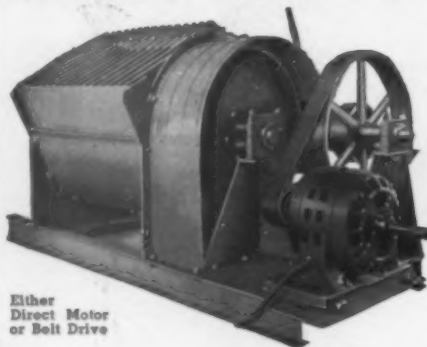


The Most Simple Block Machines Ever Made

FULLY PRESSED TOP units are perfect in dimensions, with sharp edges and square corners. They lay up into beautifully designed walls that are less expensive to finish. FULLY PRESSED TOP units are made only on Besser Plain Pallet Strippers.

All Units Made on One Set of PLAIN Wood or Steel PALLETS

BESSER BATCH MIXERS



Either Direct Motor or Belt Drive

5, 12, 18, 25, 30, 40, 50 Cu. Ft. Sizes
Ask for Illustrated Catalog

BESSER PLAIN PALLET STRIPPERS

The Saving in Pallets Pays for a Besser Plain Pallet Stripper

FULLY AUTOMATIC—3 models—Capacities: 2000 to 4000 units per day.
SEMI-AUTOMATIC—4 models—Capacities: 1000 to 2000 units per day.
POWER OPERATED with Hand Controls—2 models—Capacities: 800 to 1500 units per day.
MULTI-MOLD—Hand Operated—Capacities: up to 300 units per day. For manhole blocks, brick, slabs and small cored units.
AUTOMATIC BRICK MACHINES—Capacities from 10,000 to 50,000 units per day. For brick, slabs, coal cubes and other small units.

+++

Besser Plain Pallet Strippers are made under one or more of the following Patents of which Besser Mfg. Co. is sole owner.

No. 1,472,399 by S. H. Pettengill
No. 1,572,305 by A. P. Nelson

No. 1,699,218 by J. H. Besser
No. 1,706,647 by J. H. Besser

These are the only patents ever granted on concrete stripper block machines using plain pallets, and they completely cover the basic plain pallet stripper principle. Other patents pending on improvements. No firm or individual is licensed or allowed to make machines under any of these patents.

Write for Besser Plain Pallet Stripper Catalog

BESSER MANUFACTURING CO.

COMPLETE EQUIPMENT FOR CONCRETE PRODUCTS PLANTS

Complete Sales and Service on BESSER, ANCHOR, CONSOLIDATED, IDEAL, HOBBS, UNIVERSAL, PORTLAND

207 38TH STREET

ALPENA, MICHIGAN

EVERY CONCRETE PRODUCTS PLANT NEEDS A BESSER PLAIN PALLET STRIPPER

New Architectural Applications of CONCRETE PRODUCTS IN COLOR

As Described by

W. F. DOUGLASS

Vice-President and Treasurer, Hansard and Sexton Co.

IN RESPONSE to a rapidly growing demand for color in architecture, Hansard and Sexton, Inc., of Nashville, Tenn., established in 1936, has developed a varied line of colored concrete slabs and tiles which are finding widespread acceptance in residences, theatres, stores and other types of construction.

Designated "Coloroc" by the Superior Cement Corp., Portsmouth, Ohio, originators of the units and the manufacturing process, the tile and slabs are vibrated in live rubber molds to give the desired smoothness of surface and color effects.

As every imaginable color or blendings of colors may be reproduced to create a marble-like appearance, the designer or architect, has unlimited freedom, as to color and shape, in specifying colored concrete units. Stock sizes include 3- x 3-, 3- x 6-, 4- x 4-, and 6- x 6-in. concrete tile, 1/2-in. thick, either in solid or blended colors; 6- x 6-, 6- x 12-, and 12- x 12-in. tile in 3/4-in.

thicknesses; and 24-in. sq. reinforced slabs 2-in. thick, which are load-bearing and are designed for the construction of concrete floors placed on precast concrete joists spaced on 2-ft. centers.

In addition to the stock sizes, a number of other shapes and thicknesses in colored tile, or uncolored, are manufactured, many of which are made to order. Large slabs are manufactured for wainscotings, window-sills, stair treads, floor construction, roof decks, and partition walls, and are used for both exterior and interior construction. The smaller tile are often super-imposed on uncolored floor slabs and arranged to any specified design. These units are sold extensively for mantels, bathroom walls, kitchen floors and walls and wherever else color is desired in a home or other structure.

Manufacturing equipment consists of a small vibrating table, color mixing bins, concrete mixing equipment, rubber pallets, and facilities for curing and storage of the finished slabs and tiles.

Probably the costliest equipment used in the manufacturing process is the stock of rubber pallets. To make them quickly available for re-use, high early strength portland cement is used exclusively in this plant.

In manufacturing the various tiles and units, the pallets are placed in a wood frame, having a depth corresponding to the thickness of the unit to be made, which holds the shape of the rubber pallet during vibration. The coloring is a mixture of the desired mineral color, white silica sand, white cement and water. When the rubber pallet, or mold, is located in its wood frame on the vibrating table, the colored mix is placed in it by trowel to the approximate thickness desired. Thicknesses vary from about 1/8-in. in the smaller tiles to 3/8-in. in the 24-in. sq. floor slabs. A very dry mix is used. The vibrating table is then started up and continued in operation until the facing material has levelled out and excess water has risen to the surface. The vibrator is a small steel table

Below: Vice-president W. F. Douglass poses for the camera in front of a display of "Coloroc" tile outside his office. This "proving ground" has demonstrated the resistance of the facing colors when subjected to all sorts of weathering conditions



Above: Display room in office of Hansard and Sexton Co., Inc., where can be seen an almost inexhaustible variety of color combinations in concrete tile. In the foreground is shown a load-bearing slab cut to reveal reinforcing bars



STANDARD TAMPER

MULTIPLEX

Leads the way to Bigger Sales and Profits

... with highest quality blocks and lowest production and upkeep costs.

Every MULTIPLEX machine is designed for capacity production of quality building units at low cost. Simple in design but sturdy in construction—they will provide a lifetime of trouble-free service.

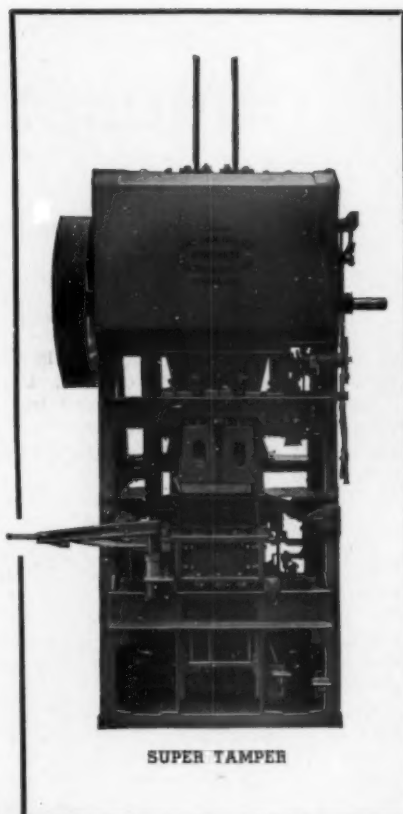
The MULTIPLEX Super-Tamper makes all sizes of blocks, tile, brick or back-up units in any length of standard sizes and produces them in one or two units of operation. Note these special features: Position-timed feeding and stripping, new improved tamp feet, automatic feeding, one-trip clutch for stripping, and strike-off hopper, split bar front and rear tamping, positive hopper guides independent of mold box, counterbalanced cam shaft and heavy welded steel frame.

Write today for complete details about MULTIPLEX Hand Machines, Double Strippers, Single Strippers, Tile Machines, Flue Block Machines, Random-Ashlar Machines, Brick Machines, Moulds, Forms, Power Machines, Power Presses, Power Tampers, Power Strippers, Super-Tampers, Mixers, Cars, Racks.

Complete plants designed and installed.

**THE MULTIPLEX
CONCRETE MACHINERY CO.**

ELMORE OHIO



SUPER TAMPER

Why R&L Equipment Makes Better Products

Nearly thirty years' experience in building concrete pipe machinery have resulted in the development of R & L forms which make perfect reinforced pipe. Every detail exactly worked out, whether for 8" or 108" diameter.

This all-steel bell-end form is constructed of prime blue-annealed steel, substantially reinforced with angle and bar steel, electric welded and riveted to insure long life and uniform pipe.

Every part is precision made and the entire unit is so easily operated that any common laborer can run it with a few simple instructions.



The R & L line also includes all sizes of Reinforced Tongue-and-Groove pipe forms.

Send for details about the R & L 10-gang joist molds for making perfect concrete joists.

THE R&L CONCRETE MACHINERY CO.
KENDALLVILLE, INDIANA

LOW COST BLOCKS
are made on

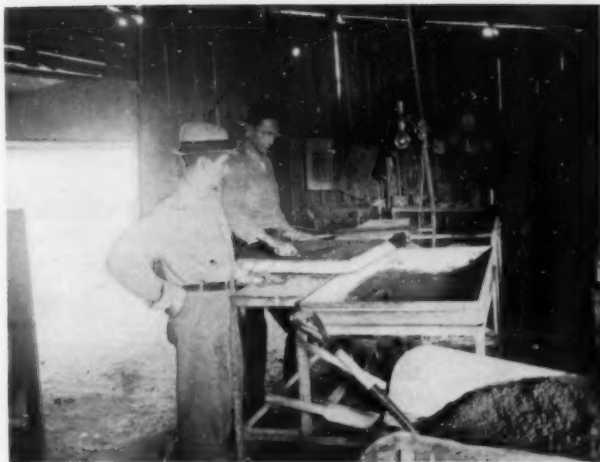
**COMMERCIAL
CORED PALLETS**

*Uniform curing.
Free air Circulation*

Made of Steel—will not Break, Crack, or Warp—will fit low cost Block machines, all types.

Ask your machine manufacturer for
COMMERCIAL CORED PALLETS

The **COMMERCIAL SHEARING &
STAMPING COMPANY**
YOUNGSTOWN, OHIO



Left: Striking off excess concrete from a reinforced slab before applying vibration. Right: Workman is preparing to take finished floor slab from vibrating table into the curing room

through which pulsations are imparted to the mold by an off-center shaft, powered by a small motor. Its design is similar to many precast concrete joist vibrating machines now in use.

After the facing material has been vibrated into place, it is allowed to stiffen for about 45 minutes, before placing the backing concrete, to insure against displacement during the second vibration which follows.

Lightweight Aggregate

The back-up is a mixture of "Tuff-Lite", lightweight, insulating aggregate, high early strength cement and water. The mix is about 1:6, consisting of two parts of coarse Tuff-Lite ($\frac{3}{8}$ -in.), two parts of fine Tuff-Lite ($\frac{1}{8}$ -in.), and two parts of river sand ($\frac{1}{8}$ -in. minus) in the larger slabs. For smaller units, the large aggregate is omitted and the ratio 1:6 is maintained by finer material. The mix contains about one gallon of water to the sack of cement. The backing of concrete is placed by trowel or shovel and vibrated into place, the operator striking off any excess concrete and water that has come to the surface.

Vibration is applied for from 15 to 35 seconds, proportionate to the thickness of the unit. After a day of moist curing (summer), the pallet is stripped off ready for re-use and the unit is allowed to cure under inside storage until shipment. The rubber pallets are washed in plain soap and water. To get the desired glaze in the surface of the tiles, it is necessary that the pallet be absolutely clean.

Concrete slabs, 24-in. square, are designed for floor construction, and are used in place of poured slabs superimposed on concrete joists, and laid on 2-ft. centers. Each of the four edges of the unit has a groove to permit the use of $\frac{3}{4}$ -in. steel reinforcing rods in the

mortar when the slabs are placed over the concrete joists. These rods are also placed in the forms for structural reinforcement. For floors in a residence, the slabs are sometimes made with a colored facing, either solid or mottled, or are cast without color if 12-in. sq. tile or other sizes are to be superimposed on the load-bearing slabs. This is done on the job by the application of a layer of cement grout. The same pallets are used in the manufacture of roof deck slabs, by reversing the tension reinforcing steel. These units are laid with the smooth face down.

Sometimes coloring is applied by pre-mixing the colors for a varied or mottled effect, or the predominating color mortar is placed in the mold first and the remainder of the face filled with the subordinate colored mortar. Many variations and combinations are custom-made for residential construction. Capacity of the plant, with two men employed, is about 200-sq. ft. of slabs and tiles in 8 hours.

Demonstration House Sells the New Product

To promote the sale of colored concrete tiles and slabs, Hansard and Sexton, Inc., have taken an active part in developing a market for concrete houses locally and in surrounding cities. When starting the business, local tile-setters, architects and contractors were first contacted and shown the merits of colored concrete for residential and other construction.

But the real place to display the various colored units was in a public demonstration house, which was constructed coöperatively by local concrete products manufacturers, the local cement company, paint concerns, contractors and others. When the building—a 100 percent concrete house—was completed, these concerns carried a

$\frac{1}{4}$ -page advertisement in the local newspaper announcing its opening for inspection. In this display the house was illustrated and the copy pointed out the advantages of concrete. Listed in the advertisement were the coöperating companies, their addresses, and telephone numbers.

Over 4000 people responded to one of these advertisements the first day. Hansard and Sexton, Inc., had the opportunity to discuss the merits of its products at the house, and after the demonstration was over a good prospect list was available directly traceable to the display. This type of advertising has brought results, the company now having a number of beautiful, completed installations in Nashville and others under construction, in theatres and homes. Many of the floors in these buildings are custom built. One of their most outstanding installations of colored tile is in the floors of the dining room and waiting room of new Municipal Airport.

In addition to these products, a number of trim pieces and a variety of special products are being manufactured in "Coloroc". Among them are "Coloroc" acoustical tile, which is pierced at regular intervals to allow penetration of sound to the sound absorbent backing; bulkhead and wainscot slabs made to requirements in lengths up to 6-ft., either in solid or blended colors; safety tread floor tiles with abrasive aggregate exposed in the wearing surface and others too numerous to mention.

Hansard and Sexton, Inc., with offices at 3628 Minnesota Ave., Nashville, Tenn., has a contract with the Superior Cement Corp., covering the licensing of "Coloroc" tile plants throughout practically the entire country. O. H. Hansard is president and W. F. Douglass is vice-president and treasurer.

Equipment Designed to Produce A Uniform, Dense Product

SPECIALIZE IN LARGE PIPE

SPECIALIZING in the manufacture of the large sizes of concrete pipe, both tongue-and-groove and bell-and-spigot, the Mid-South Concrete Pipe Co., Memphis, Tenn., is producing pipe to meet specifications in the states of

Attachment Assures Uniform Tamping Blows

Pipe, from 12 to 54 in. in diameter, are manufactured on a Shearman tamping machine; larger pipe, up to 108 in.

adjustment being regulated according to the wear of the tamper on friction blocks. The tamper strikes 500 blows per minute.

Capacity of the plant is about 45 tons of pipe in 10 hr., based on an average diameter of 30-in. Pipe are cured in four 20- x 80-ft. kilns, and are kept moist in the kilns by overhead sprays. The company has $4\frac{3}{10}$ acres of land available for outside curing and storage. Reinforcing steel cages are welded in the shop by a Shearman electric butt welder.



Left: Close-up showing details of pipe-making machine. Below: The plant is unitized, concrete being delivered by drag conveyor from mixer on right



Tennessee, Arkansas and Mississippi.

The plant, of galvanized iron construction was built a little over a year ago, and is one of the most modern in the south. It was constructed adjacent to the Missouri-Pacific belt line so that pipe reinforcing steel may be received by rail. Aggregates and cement are delivered to the plant in trucks.

diameter, being hand cast. The plant layout is unitized and consists of the pipe machine and a 14-cu. ft. Ideal mixer, which is not overhead, but discharges to a drag-type elevator that delivers concrete into the pipe forms. An attachment has been placed on the machine to insure that the tamper will strike uniform blows all the time, the

Electric Hammer to Vibrate Hand-Made Pipe

Pipe are tested for strength in a Black and Decker Loadometer, and the electric hammer is used on hand-made pipe to vibrate the concrete into place. The company has recently completed a contract for pipe to be used in the Memphis intercepting sewer construction, including a number of 60-in. diameter pipe with a 45 deg. angle bend. These pipe, illustrated below, are another example of "specials" which should be manufactured by the concrete products manufacturer who desires to be progressive, and oftentimes the willingness and ability to make them mean more business. Mid-South Concrete Pipe Co. attaches considerable importance to this type of work. These particular pipe were hand cast using the electric hammer to place the concrete in the pipe forms.

R. S. Monday, Knoxville, Tenn., is president of the company and Lloyd M. Parker, Memphis, is secretary-treasurer and general manager.



Left: Concrete pipe specials cast for construction of Memphis intercepting sewer. Right: General view of the outside stockpiles with the plant and curing kilns in the background

Straight-Line Production Methods Used In

MANUFACTURING BRICK

MANUFACTURE OF "Dunbrik" and "Dunstone" concrete units has been started by the Dunbrik Manufacturing Co., Bowling Green, Ky., recently incorporated. The firm has been licensed by the W. E. Dunn Co., Holland, Mich., to have exclusive sales rights for "Dunbrik" in the five adjoining counties.

Production is carried on in an entirely new 36- x 40-ft. galvanized iron structure, and eight acres of land have been provided for open storage. All units are manufactured on a "Dunbrik" straight-line production type machine with a capacity of 32 standard brick per minute.

Aggregates used are a half-and-half mixture of stone, which is plentiful locally, and graded sand to fill the voids. Top size of the stone aggregate is 3/16 in. Aggregates are wheeled from the outside stockpiles or inside storage to a scale for accurate proportioning before discharging to a 10-cu. ft. skip. The skip bucket discharges to a mixer above the brick machine. Here water is added in exact proportions by the operator below who controls the amounts by a turn valve and an accurate recording meter. For mixing and spray curing the company pumps its own water by means

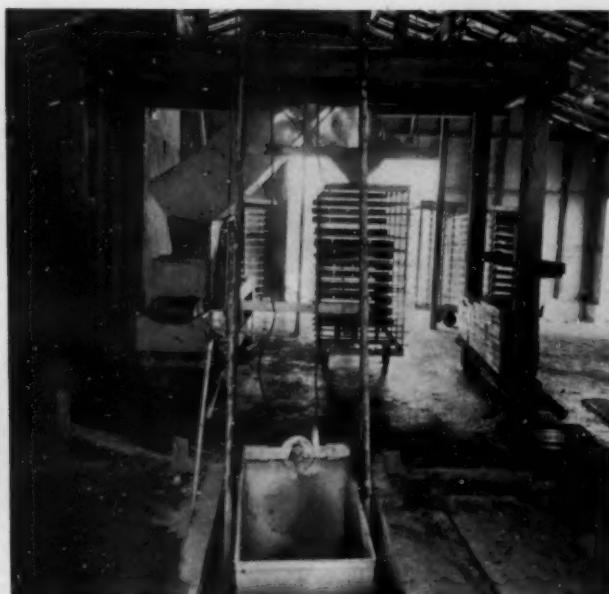
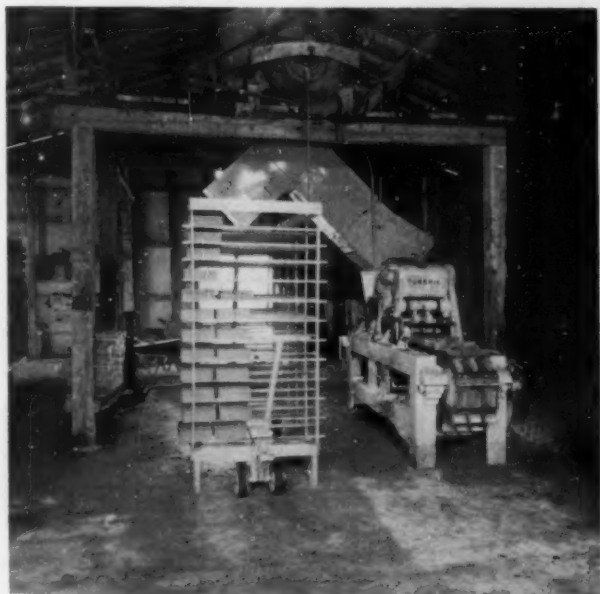


J. L. Travis, plant manager of Dunbrik Manufacturing Co., Bowling Green, Ky., standing in front of new concrete brick plant

of a Deming deep well pump which discharges to a 240-gal. pressure tank.

After proper mixing, the mixer discharges through a hopper, feeding the brick machine. Two hoppers are pro-

vided to allow for future expansion. One man is required to take the finished brick from the machine and pile them on curing racks. Ten of these racks are used, each having a capacity of 720



Left: Utilized plant for the manufacture of concrete brick. To the right is the straight-line production brick machine, above is the concrete mixer, and to the left is shown the curing rack. Right: Skip bucket in loading position to receive aggregates and cement for delivery to the mixer, and to the left may be seen the brick machine

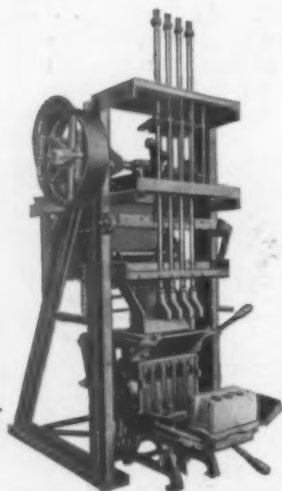
At present all brick are spray cured in open storage, but it is planned to later install steam curing. The loaded racks are handled from the machine by a Colson lift jack.

High early strength cement was used at first in building up a stockpile. Plain brick and faced brick as well as Dunstone are being manufactured. Faced brick are surface colored with cement paint by a compressed air spraying machine. The brick machine is driven by a 3-hp. motor while a 5-hp. motor powers the mixer.

J. L. Travis is plant manager and S. R. Travis is sales manager of the company.

To Make Lightweight Units

BERT A. LEITZEN, Rochester, Minn., concrete products manufacturer, is planning construction of a new plant this summer in which he will manufacture concrete brick and cinder block. The plant will be a two-story structure, with mixers on the floor above the block machines. When completed, all products will be steam cured and the plant will operate throughout the year. Other units manufactured are standard concrete block, chimney block, flower pots and miscellaneous ornamental precast concrete units.



"ANCHOR"

Complete equipment for making concrete, cinder and other light weight aggregate units, including engineering service for plants and revamping of old ones for more economical service.

Hobbs block machines, Anchor tampers, Anchor R. strippers, Stearns power strippers, Stearns mixers, pallets, Straub-Oscillating attachments, etc.

Repair parts for Anchor, Ideal, Universal, Stearns, Blystone mixers and others.

Anchor Concrete Mch. Co.

G. M. Friel, Mgr.

Columbus, O.

Portable Central Mixing Plant

ALLIED CONCRETE PROCESSING, INC., Indianapolis, Ind., has been using a portable mixing plant to meet a problem



Views showing portable batching plant in operation near railway track

with which they were confronted in supplying ready-mixed concrete for construction at points that are not convenient to highways but are within reach of railroad trackage. The plant was also designed to make possible a more accurate control of the ready-mixed concrete at the point where it was being poured. On one of their recent large jobs, there was a 9-mile haul from the plant where the aggregates were being produced. With the portable plant, only

three ready-mixed concrete trucks were required at the delivery end, but 22 dump trucks would have been needed to haul aggregates under the former system. Water is automatically metered out for the batcher, a boiler of 2200 gal. per hour capacity furnishing the heated water during the winter. Walter E. Howard, president of Allied Concrete Processing, Inc., designed the portable plant.

Concrete Products Plant

LOCK JOINT CONCRETE PIPE CO., Kansas City, Mo., and Richard H. Wood, Emporia, Kan., will operate a new concrete products plant now under construction in Emporia, Kan. Principal products will be concrete culvert pipe, concrete sewer pipe, concrete block and concrete silos. All of the building units are to be cast on an electric vibrating machine. Previous to his new connection, Mr. Wood was senior paving and bridge inspector for the Kansas Highway Commission.

Takes Over Concrete Product Licensing Rights

R & L CONCRETE MACHINERY CO., Kendallville, Ind., has just been appointed the exclusive agent for licensing the manufacture of insulated natural stone under the McKenzie patent as successor to the Insulated Natural Stone Co., Milwaukee, Wis.

Now Making Block

THOMAS CONCRETE PIPE CO., Ada, Okla., manufacturer of concrete culvert tile and concrete sewer pipe, has recently installed machinery to make concrete block in a number of sizes. The pipe plant was opened in 1935.

Adds Concrete Block Plant

CONCRETE SUPPLY CO., Evansville, Ind., manufacturer of ready-mixed concrete, has opened a new plant for the manufacture of concrete block, with a capacity of 100 to 125 block per hour. The blocks are to have a mortar groove to prevent sliding of the units when placed in construction, and will be steam cured.

CEMENT COLOR

STAR and ANCHOR COLORS

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C. K. Williams and Co., Easton, Penn.

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A beautiful dark, sparkling granite material for cement facing, artificial stone and all cement articles.

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MOLDS

FOR SALE

New Steel MOLDS for the Beautiful and Successful Patented RIB-STONE Stave Silo.

THE S. W. SIDER BROOM WKS.
Logansport, Indiana

Concrete Block Plant

NOHL AND SCHMIDGALL, Morton, Ill., have gone into the concrete block business and have established a plant at the intersection of routes 150 and 121. A new block machine was installed to manufacture 1000 to 1500 units per day. Arnold Nohl and J. R. Schmidgall, owners, will operate the plant.

Concrete Burial Vaults

WILLIAM J. NOLAN, New Haven, Conn., a manufacturer of concrete burial vaults at Milford, Conn., is reported to be considering construction of a new vault plant at West Haven, Conn. The owner of the site under consideration has applied to the local zoning board of appeals to have the land re-classified as industrial property.

Concrete Tile Plant

JOHN R. BREWER and LEE HOPPER have opened a new concrete tile plant at Mountain View, Ark., and are manufacturing tile for road drainage and other drainage purposes.

Another Branch Plant

UNIVERSAL CONCRETE PIPE CO., Columbus, Ohio, has begun construction of two buildings in Youngstown, Ohio, and will manufacture concrete sewer pipe, drain pipe and other types. Production is to start August 1 with a crew of 20 men.

Ready-Mixed Concrete

ANDERSON-DUNHAM CONCRETE CO., Inc., Baton Rouge, La., is introducing ready mixed concrete locally, mainly for industrial construction. Production started in January at a new plant, representing an outlay of about \$75,000. Aggregates are shipped to the plant over the L and A railroad and stockpiled by a $\frac{3}{4}$ -cu. yd. Northwest clamshell. The plant consists of a 50-cu. yd. Butler bin partitioned for two sizes of

gravel and one of sand, a Butler aggregate batcher and cement batcher. Deliveries are made in eight Ford trucks equipped with $1\frac{1}{2}$ -cu. yd. Rex transit mixers.

Sales have increased from 800 cu. yd. the first month to about 2000 cu. yd. in April. James L. Anderson is president of the company, Ted Dunham is secretary-treasurer, K. O. Hall is vice-president, and Henry Taylor is superintendent of the plant.

Record Ready-Mix Haul

R-M CONCRETE DIVISION, South Texas Brokerage Co., Corpus Christie, Tex., claims the long-distance record for delivery of ready-mixed concrete. An oil-well driller at Placedo 97 miles away, wanted $4\frac{1}{2}$ cu. yd. of 1:2:4 mix for a foundation. It was delivered in three $1\frac{1}{2}$ -cu. yd. Rex truck mixers on Ford chassis. The batchers at the plant are Blaw-Knox. The trucks left the plant at 10 a. m. and were back at 6 p. m.

Building Improvements

WRIGHT COUNTY CONCRETE PRODUCTS CO., Soo Town, Minn., has built a new office building, a storage shed for drain tile and has installed a new machine to manufacture culvert pipe. The plant is reported to be working extra shifts to keep up with orders.

SHELTON CONCRETE PRODUCTS, Bayshore, Wash., has completed extensive improvements including a re-arrangement of bins and installation of new motors and pumps.

Demonstration Houses

THREE CONCRETE DEMONSTRATION HOMES are under construction in Muskegon, Mich., by S. H. Markle and Joseph Chadwick. The houses are to have walls and partitions of slag concrete block, and the floors are to be made up of precast concrete joists and concrete slabs.

Consideration for Labor Pays

NEBRASKA CEMENT CO., Superior, Neb., is one of several cement companies which are attempting to operate one or two kilns continuously, rather than operate at capacity and have long shut-downs. As everyone knows, this scheme is not efficient in point of costs, but it permits continuous employment of at least a large part of the plant crew. It is good to see such a policy rewarded by public recognition, as is the case here, according to the local newspaper (*Superior Express*), which published the following:

"The cement company, notwithstanding the falling off in business, has maintained practically its full force here, 100 men now being on the payroll. By operating the other kilns for a short time, the company could have closed down its plant completely, at a large saving to itself, but elected to keep the men at work.

"The large cement plant payroll means a lot to Superior, as every business man here well knows, and every business house in town greatly benefits from it. Besides the payroll, the cement company spends a lot of money every month directly with many local places of business.

"Superior is duly appreciative of the Nebraska Cement Company's efforts to keep the wheels of business turning here, and a united effort by the Superior Chamber of Commerce and every local business man for concrete instead of oil for Highway No. 14 north from Superior to Highway No. 6, might be a good way to express that appreciation. Besides, concrete is the proper surface for an important, heavy traveled highway such as No. 14 is known to be."

Destroyed by Fire

MARTIN BROS. cement block plant in Yardville, N. J., was damaged to the extent of \$10,000 by fire of undetermined origin on June 11. Two dump trucks and concrete block manufacturing machinery were destroyed, but the plant structure was saved.

YAKIMA CEMENT PRODUCTS CO., Yakima, Wash., has been closed by a strike of employees. Farmers, cannery representatives and others are demanding that the city pass an ordinance preventing picketing of the plant by anyone who is not an employee.

LOUISIANA MATERIALS CO., INC., 1510 Julia St., New Orleans, La., has erected a concrete pipe manufacturing plant to cost \$30,000.



Left: New ready mixed concrete plant of the Anderson-Dunham Concrete Co., Inc. Right: Revolving drum type truck mixer

• NEWS • OF • THE • MONTH •

Cement in Japan

HSINKING GOVERNMENT, Japan, has recently licensed three cement companies to increase their plant capacities to meet increased demands for cement in Manchukuo. It is estimated that at least 1,110,000 tons of cement will be consumed in 1938. Manchurian Onoda plans to increase its capacity by 60,000 long tons, Manchurian Cement Co. by 120,000 long tons, and Daido Cement Co. by 60,000 long tons, which would increase the total capacity of the seven cement concerns in Manchukuo to 1,350,000 long tons.

To Make Rock Wool

P. J. SONNER BURNER Co., Winfield, Kan., has started construction of a rock wool plant just outside the city limits, after considerable exploration of available rock deposits. Associated in the new industry will be Victor Mottweiler and his father, O. M. Mottweiler, both of Alexandria, Ind., who have had many years experience in the manufacture of rock wool. Victor Mottweiler will be superintendent of the new plant. O. M. Mottweiler holds a number of patents on manufacturing rock wool and had been associated with Johns-Manville Co. before he went to the General Insulating Co. as vice-president and superintendent in 1925.

Bankrupt

PARKER GRAVEL Co., Inc., Shreveport, La., has filed bankruptcy proceedings, claiming insolvency and inability to meet outstanding obligations including wages of employees. The company fought involuntary bankruptcy proceedings brought against it in 1934 for two years and in 1936 had been awarded a judgment in federal court allowing it to continue operations.

Sues for Power Failure

MONOLITH PORTLAND CEMENT Co., Los Angeles, Calif., has brought a damage suit for \$286,400 against the Western Public Service Co., for alleged failure to supply power to the cement plant at Laramie, Wyo. The cement company charged violation of its contract with the power company and extensive damage to its plant, products and reputation. The petition charged that energy failures occurred in June, July, August and October, 1937, preventing the sale of 18,291 bbl. of cement valued at \$34,000, and causing damages to the

kiln linings of \$2400 and \$250,000 general damage to the company.

Asbestos

STANDARD ASBESTOS MANUFACTURING AND INSULATING Co., Houston, Texas, has started construction of a plant in Houston. The land and factory will represent an investment of about \$36,000.

Rock Asphalt

KENTUCKY ROCK ASPHALT Co., Kyrock, Ky., has started production with 300 men after a shut-down of seven months. The asphalt industry is expected to have a good share in the Kentucky road construction program this year.

Cement Distribution Plant

HURON PORTLAND CEMENT Co., Detroit, Mich., has made arrangements at Green Bay, Wis., to pack and bag cement direct from its boat, the "Samuel Mitchell," which is tied up at Leicht dock. The boat, having a capacity of 15,000 bbl. of bulk cement, will serve as a temporary cement elevator, and cement will be pumped to a conveyor over a packing machine of 1000 bbl. hourly capacity. Cement boats will draw alongside and pump cement into the hold to replenish storage. At nine other locations on lake ports, the cement company operates permanent cement elevators.

Resume Production

LEHIGH PORTLAND CEMENT Co., Metairie Falls, Wash., plant has placed a second kiln into operation, with the addition of 25 to 30 men.

SUPERIOR PORTLAND CEMENT, INC., Concrete, Wash., plant recently resumed operations.

MARQUETTE CEMENT MANUFACTURING Co., Oglesby, Ill. plant resumed operations in May after a brief shutdown.

LEHIGH PORTLAND CEMENT Co., Oglesby, Ill., plant started up again in May after a short shutdown.

LONE STAR CEMENT CORP., Bonner Springs, Kan., plant quit production on June 1 to make changes in equipment and necessary repairs.

MISSOURI PORTLAND CEMENT Co., Memphis, Tenn., has a permit to construct six reinforced concrete bins at a cost of \$17,000.

Sand and Gravel Activities

LINCOLN GRAVEL Co., Star City, Ark., has been purchased by J. P. McNulty, Pine Bluff road and bridge contractor who is installing a gravel washing plant.

JEFFERY-KAYS SAND AND GRAVEL Co., Batesville, Ark., has been organized to do a general contracting and sand and gravel business. The company operates several boats and barges on the White river and has under construction a new \$15,000 sand and gravel plant north of Harrisburg, Ark. Roy Jeffery and Carl Keys are partners.

RAY HOOTEN, Greenfield, Ind., is opening a new sand and gravel pit and is building a new plant.

CALVERT FUEL AND SUPPLY Co., Detroit, Mich., is building a gravel plant at Clarkston, Mich., at an estimated cost of \$50,000. Capacity of the plant is 15 to 25 carloads per day. About 100 acres of land were purchased. The company in the past has purchased large tonnages of gravel for its Detroit market.

A. W. WILKEY AND SON, Risco, Mo., have purchased the rights to a large sand and gravel deposit near Marston, Mo., and are building a screening plant. A sales office and loading facilities for rail shipment are to be established at Marston.

PIONEER SAND AND GRAVEL Co., Tacoma, Wash., suffered fire damage estimated at \$75,000 to \$100,000 on June 5, when flames from a nearby factory fire spread to the plant warehouse.

J. W. FAGAN, JR., Laurel, Miss., is considering development of a large sand deposit, which is said to contain a product ideal for plaster, stucco, brick work and other uses which require a fine product.

MANNING AND LOCKLIN NORTHVILLE Co., Detroit, Mich., has installed new screens in the plant at Northville, Mich., to improve the sizing and washing of aggregates.

HILLISIDE GRAVEL Co., Inc., Sweetwater, Texas, has completed a new all-electric sand and gravel plant of 400 cu. yd. daily capacity at Colorado, Texas. C. C. Johnston, vice-president and manager of the Sweetwater plant, will manage the new plant and Claude Storey is plant foreman.

Tornado Damages Plant

CARBON LIMESTONE Co., Youngstown, Ohio, suffered damages estimated at \$15,000 recently when a tornado ripped down a 300-ft. section of conveyor at the plant at Hillsville, Penn. The damaged conveyor is used to convey agricultural stone to the stockhouse.

Freight Rates

NEBRASKA state railway commission has adopted a new schedule of sand and gravel freight rates, effective June 3, from 5 to 15 cents per ton lower than existing rates, to run until the end of the year. The new schedule seeks to standardize a large group of existing rates and applies to all roads except the Missouri Pacific.

Plant Inspection Tour

CARBON LIMESTONE Co., Hillsville, Penn., plant was to undergo inspection recently by a county-wide tour arranged by the local county extension office, so that farmers and others interested might see how agricultural stone is produced. The company has been very active in selling agricultural stone in the county.

To Rebuild Power House

MASSACHUSETTS BROKEN STONE Co., Waltham, Mass., is planning to rebuild the power house at its plant located at Stonybrook, Mass. The power plant was destroyed recently by fire with a loss estimated at \$75,000.

Electrocuted

CAMPBELL LIMESTONE Co., Inc., Gaffney, S. C., had an accident in which an employe was electrocuted June 16 in its quarry while preparing to blast. The employe accidentally touched a wire carrying 110 volts, while standing in a shallow pool of water and his clothing was wet.

South American Plant

COMPANIA DE CEMENTOS PORTLAND DIAMANTE OF BOGOTA, Columbia, S. A., has engaged S. A. Mewhirter for advisory work in connection with construction of a cement plant at Bogota. The company operates two cement plants on opposite sides of the Central Cordillera mountain range.

Cement Warehouse

MARQUETTE CEMENT MANUFACTURING Co., Chicago, Ill., is going ahead with its plans to build a cement terminal at Vicksburg, Miss. Bids are reported to have been filed for filling in the selected site for the plant to raise the property out of damage of flood waters. When this work is done two railroad tracks will be laid on the plant site.

Quarries Reopen

JAMES RIVER MARBLE Co. quarries near Howardsville, Va., have been reopened and a minimum capital stock of \$100,000 will be subscribed for the plant, according to announcements. Marble is to be gotten out and stone will be taken from some strata for highway material, agricultural purposes, railroad ballast and possibly for the manufacture of rock wool, according to present plans.

JOE WINKE, Cedar Rapids, Iowa, has opened a quarry northwest of Bonaparte, Iowa, to produce commercial and agricultural limestone.

OCEOLA STONE Co., Oceola, Ohio, a new concern, went into production early in June on land adjacent to a quarry abandoned years ago. Officers of the company are Matt Otto, general manager; Virgil Hern, president; Walter Gearhart, secretary; and Harry E. George, treasurer.

YOUNG AND WILEY STONE Co., Towanda, Kan., is installing a new crusher to increase the plant capacity from 75 tons of crushed stone per day to 250 tons.

THERESA, N. Y., is opening a stone quarry and will sell stone to the county for the repair of local county highways. The plant is to be located on the C. B. Cheeseman farm.

PAUL FRANK, quarry operator at North Vernon, Ind., has orders on hand for about 50,000 tons of crushed stone for concrete aggregate and ballast and is reported to be working double shifts.

J. E. BAKER Co., York, Penn., has purchased 235.75 acres of land in Jackson township, Ohio, as a reserve quarry supply at a cost of \$24,620, but does not intend to open the supply of stone in the immediate future. The property is adjacent to the Pennsylvania Railroad.

E. GITTINGS has leased the Rockel limestone quarry three miles east of Dallas City, N. Y., and has started to produce commercial and agricultural stone.

STURGEON BAY Co., Sturgeon Bay, Wis. plant, underwent considerable repair before starting operations this year. One of the major improvements made was the installation of a conveyor tunnel which is used to reclaim stone from stockpiles for re-crushing.



The Service Record of this wire rope continues to make and hold friends.

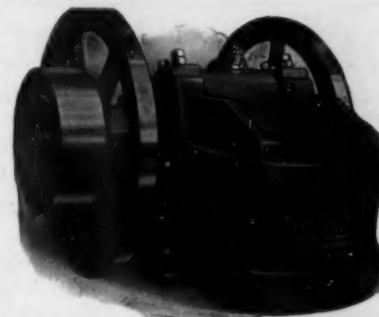
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AIR SEPARATORS

240 STURTEVANTS sold on approval for Cement. Not one rejected.

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Engineered Installations for raw or clinker show 25 to 100% capacity increase.

STURTEVANT MILL COMPANY

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BOSTON, MASS.

Costs too High

WORCESTER, MASS., will close the city-owned sand and gravel plant if it follows the recommendation of auditors who find that commercial plants can produce and deliver material on city jobs at lower cost. Earnings of the city sand and gravel plant in 1937 equalled the expense of operation and maintenance, exclusive of depreciation on the screening plant. Recent proposals specify the delivery of sand and gravel to designated locations approximating the city's plant production cost alone. Let's hope that other municipal and governmental agencies operating rock products plants will start to check up on all their costs.

Large Aggregate Order

J. K. DAVISON AND BROS., Pittsburgh, Penn., and GEORGE M. BREWSTER AND SON CO., INC., Bagota, N. J., have closed a single order for 120,000 tons of sand and gravel. The material will be used in construction of the Crooked Creek flood control dam below Kittanning, Penn.

City to Compete

MARINETTE, WIS., city council has authorized the purchase of a gravel pit for \$1000, gravel to be used in the surfacing and reconditioning of city streets. The deposit is estimated to contain 200,000 cu. yd. of material.

Improves Stone Plant

CUSHING STONE CO., Schenectady, N. Y., has recently made improvements at its East Branch plant costing over \$12,000, including a large jaw crusher.

To Build Loading Dock

MARBLEHEAD LIME CO., Hannibal, Mo., plant is reported to be undergoing improvements to facilitate shipment of \$30,000 worth of crushed stone. The stone is to be used in the construction of Dam No. 25 on the Mississippi river

at Cap Au Gris and will be shipped by barge down the Mississippi river. A loading dock is to be built, for transferring the stone to barges.

Silica Plant

MID-CO PRODUCTS CO., Kansas City, Mo., has started construction of a silica plant at Edison, Neb., under the supervision of Albert Hantla, chief engineer of the company. Other silica plants operated by the company are at Meade and Satanta, Kan., and Agra, Okla.

Fire Damage

WATSON SAND AND GRAVEL CO., Fluker, La., suffered heavy damages to its plant by fire on June 17. The plant had undergone considerable improvement during the past year but was covered by very little insurance.

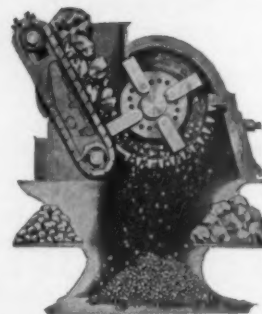
Masonry Cement

PEERLESS CEMENT CORP., Detroit, Mich., is reported to be considering the manufacture of masonry cement using caustic waste as one of the raw materials.

Agricultural Lime

LIME AND INSECTICIDE CO., Seattle, Wash., has opened a shell grinding plant at Samish Island to manufacture shell flour for fertilizer.

A New High Degree of Crushing Efficiency



More production—more profit—lower operating and maintenance costs. All these are features of DIXIE performance.

Simple in design, yet sturdy in construction, DIXIE NON-CLOG and Regular Stationary Breakers are unexcelled for primary, secondary or fine reduction. Note particularly the continually moving breaker plate which means that DIXIE Hammermills will outlast and out-perform any other type.

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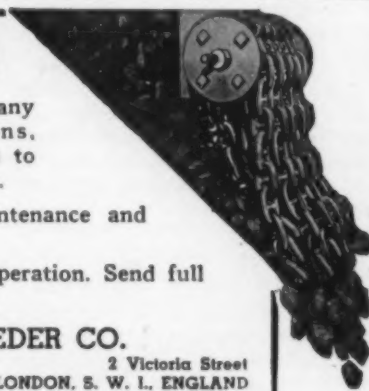
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Mortar Cement

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., has come out with an attractive circular on Lehigh mortar cement, which is in colors and illustrates the application of mortar cement in various types of construction. Lehigh first put mortar cement on the market in the spring of 1937 in the Middle West states and has now made it available over practically the entire territory served by the company. The product passes recognized specifications for mortar cement and is packed in 70-lb. multi-wall paper bags.

Court Ruling

BEDFORD-NUGENT CO., INC., Evansville, Ind., has been ordered in a decision of the Circuit Court to discontinue operations and remove equipment from land occupied at 6th and Water Sts., Henderson, Ky. According to the court, the river front area in question is embraced in "Givens Park" and cannot be used for other purposes.

Buys Marble Quarry

COLUMBIA QUARRY CO., Sonora, Calif., has been purchased by R. F. Tremoureaux, San Francisco, Calif. The transfer includes all mining and water rights, privileges, interests and other claims connected with the property which covers about 11 acres of land.

Reopens Silica Mine

RICHARD C. WILLIAMS, geologist, has leased the old silica mine at Lyons creek in Calvert county, Maryland, and has installed new machinery. The mine had been idle for five years.

Glass Sand

WICHITA, KAN., Chamber of Commerce has started a movement to push the use of sand taken from local river beds. Its industrial committee has submitted samples of the sand to a glass manufacturing concern and favorable reports have been received.

To Continue Trusteeship

CHEMICAL LIME CO., INC., Bellefonte, Penn., now undergoing reorganization under section 77B of the federal bankruptcy law, will continue to do business indefinitely under trusteeship, according to an order recently issued by the special master in the case. The trustees presented a financial report of the company's business in which was shown an operating net profit of about \$9500 for the 4½ months the trustees have conducted the business. Reconstruction Finance Corp. sought to have the special

master permit immediate foreclosure of the \$700,000 mortgage, to take over the plant and reorganize it to its own benefit.

Making Cement Again

LONE STAR CEMENT CORP., Demopolis, Ala., plant is reported to have begun production in June after six years of idleness. The plant had undergone considerable reconditioning in recent months.

After the Farm Market

UNITED STATES GYPSUM CO., Chicago, Ill., has inaugurated a new advertising campaign in a number of the better farm papers, in which is being pushed the adaptability of its new "Recessed Edge Sheetrock" and other USG products for the modernization and improvement of farm buildings and farm houses. The new Sheetrock, developed in 1937, has recessed edges and enables the laying up of a wall without showing joints, when joints are covered with "Perf-A-Tape," a new fiber tape.

Million Dollar Gypsum Plant

NATIONAL GYPSUM CO., Buffalo, N. Y., has announced plans to erect a new gypsum mill in Savannah, Ga., for the manufacture of wall board, gypsum lath and partition tile. The plant, costing about \$1,000,000, is to be located on properties of the Port Wentworth Co. with water frontage and gypsum rock will be shipped in by water from the company's properties in Nova Scotia.

To Revive Gypsum Industry?

W. E. SEAMUS, Salinas, Calif., has leased gypsum land, operated years ago by the Lyons Gypsum Co., King City, Calif., and is reported to be considering construction of a plant. It is Mr. Seamus' purpose to revive the fertilizer business which thrived years ago in the Salinas valley.

Opening Gypsum Deposit

A. R. ENO, Fort Dodge, Iowa, contractor, is stripping overburden by dragline to give access to a 2,000,000 ton deposit of gypsum which he intends to mine.

MINERAL PRODUCTS CO., Ochlochnee, Ga., operator of a large fuller's earth plant, has closed the plant and discontinued operations indefinitely, retaining only the office force. The mine was developed and the refining plant was built three years ago.

DIETZ HILL DEVELOPMENT CO., Kansas City, Mo., is to open a quarry near Carrollton, Mo., to furnish rock for highway construction.

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8 yards a minute with the Haiss "135" Loader—and no fooling. 24,000 pounds of all-steel digging and loading ability—with the drive of a 65 H.P. motor to give it POWER. Nothing flimsy—or cheap.

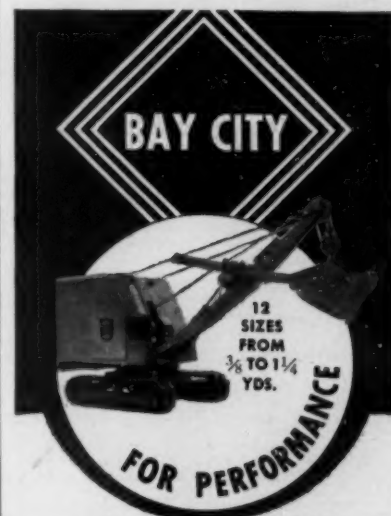
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New

MACHINERY & EQUIPMENT

Coal Pulverizer

THE BABCOCK & WILCOX Co., New York, N. Y., has developed a coal pulverizer, known as Type E, which is said to be characterized by lower power consumption, high capacity for a given grinding-ring diameter, low maintenance, and quiet operation.

Coal is pulverized by a single row of large-size balls between a stationary top ring and a rotating bottom ring driven from the base of the mill. Raw coal is fed to the inside of the upper grinding ring and, aided by centrifugal force, passes outward between the grinding balls.

Preheated air passing upward between the grinding elements and the housing picks up the ground coal particles, drying them as it carries them to a rotating classifier in the top of the pulverizer whence oversize particles are returned to the grinding zone for further reduction. Fineness of the coal delivered is regulated by the air flow through the mill. Capacities of the sizes now designed are from 2 to 13 tons per hour.

Shank and Bit Punch

INGERSOLL-RAND Co., Phillipsburg, N. J., has placed on the market an improvement in rock drill sharpening equipment, a shank and bit punch. Features include more convenient location of operating levers, safety guard for

punch and improved design, facilitating inspection and reducing breakage of punch pins in doing this kind of work.



Punch used for rock drill sharpening equipment

This punch, mounted on a sturdy one-piece bracket is adaptable to all recent Ingersoll-Rand sharpeners.

Stabilizer Plant

PIONEER ENGINEERING WORKS, INC., Minneapolis, Minn., has brought out for the market a stabilizer plant, model No. 73, for mixing aggregate, clay, water, and calcium chloride or salt. This plant is complete on one truck, and is designed for operating out of stockpiles. Two receiving hoppers are furnished, one for the gravel or aggregate and the other for the clay. A mechanical feeder under the gravel receiving hopper feeds a uniform amount to the gravel conveyor and into the pugmill.

A screw type feeder under the clay hopper measures the correct amount of clay on to the clay conveyor, then through the clay shredder and into the pugmill. A hopper and feeder measures the calcium chloride or salt, and feeds it to the clay conveyor. Water is

pumped from a storage tank alongside of the plant and sprayed on the material in the pugmill. The folding delivery conveyor, shown to the right in the illustration, delivers the finished product into trucks which carry it to the job.

Aggregate producers should find a number of applications for portable equipment of this kind in filling road construction contracts at remote locations from the plant.

Quarry Hauling Unit

BROOKS EQUIPMENT AND MANUFACTURING Co., Knoxville, Tenn., has developed a material handling unit for quarries, gypsum, and other mines, and for the transportation of concrete aggregates which is said to have several outstand-



Skip bucket unit mounted on truck has direct drive from power take-off to hydraulic hoist

ing advantages. With this unit, one truck can service 5 to 10 bodies, depending upon the material to be loaded and the distance hauled.

The unit has a direct drive from the power take-off to the hydraulic pump hoist assembly, no high pressure hose connections being used. Hoist is hydraulic and positive in both up and down motions, and the bucket is carried on the truck itself, and is not held in suspension. Guides on the bottom of the buckets prevent side sway. The bucket, made in one piece, dumps instantly and, if desired, without leaving the truck. It is easily mounted on any truck. The illustration shows the method of applying this equipment to the truck chassis.



Stabilizer plant for mixing aggregate, clay, water, and calcium chloride

Multi-Stage Air Separator

F. L. SMIDTH AND CO., New York, N. Y., has on the market a multi-stage air separator which is recommended for use in closed circuit grinding of dry raw materials, cement and other pulverized products. Classification is accomplished by an adjustable air current moving upward through successive separating chambers, the air current with the fine material particles passing to a specially designed cyclone. The cy-

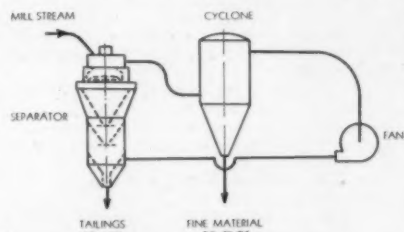


Diagram showing how multi-stage air separator is operated in closed circuit grinding. The separator, fan and separator are operated in closed circuit and the air is continuously recirculated as is shown in the accompanying diagram. Advantages claimed are: an increase in mill output, increased fineness without the need for regrinding the fines, lowered power requirement per unit of grinding-mill output, and flexibility in operation.

Light-Weight Shovel

The BYERS MACHINE CO., Ravenna, Ohio, has announced that it is now making a $\frac{3}{4}$ -cu. yd. shovel weighing 36,000 lb. which is convertible to all boom attachments.

This machine was displayed last January at the Road Show and since then has been operating continuously on a variety of difficult test jobs.

On the model No. 83, as it is called, line and swing speeds have been stepped up to increase the number of digging cycles per minute. More power per pound of weight is employed. Pre-formed rolled steel construction provides strength to safely handle the extra power. Lighter overall weight more closely approaches highway load limits, makes moving easier and less expensive and reduces ground bearing pressure. Long boom and dipper sticks increase shovel working ranges. Oversize clutches and brakes make full dippers easy to handle at wide radii. The Model 83 uses a 72 hp. gas or Diesel power plant. Major shafts are journaled in anti-friction bearings. All gears on the upper deck have machine cut teeth. Chain or cable types of shovel crowd are optional.

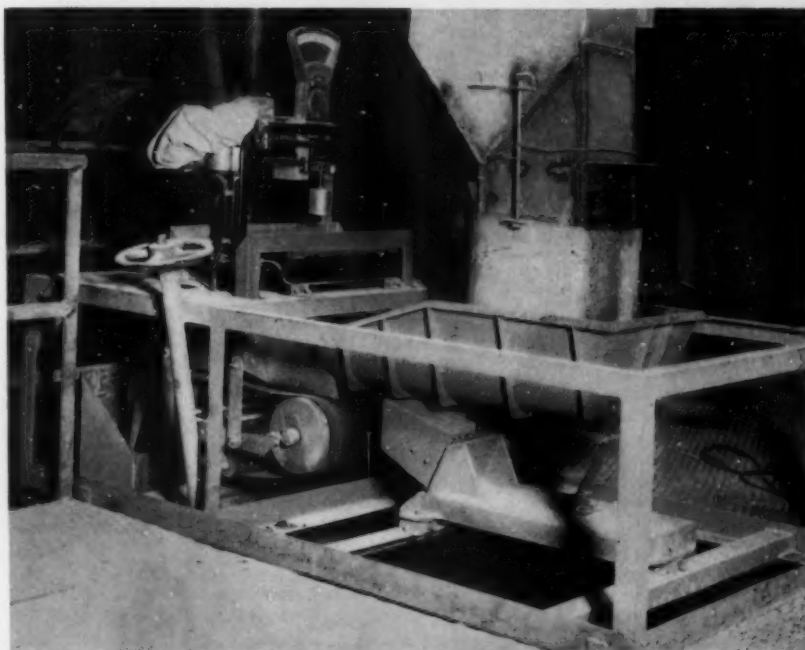


Shovel convertible to all boom attachments

Deck machinery is balanced far back of the center line of rotation. Boom loads and swing strains are absorbed by four hook rollers which ride on a roller path of wide diameter. Crawler treads are 20 in. wide and of the single-driving lug, self-cleaning type, and this model can swing while traveling, steering and hoisting.

Continuous Weigh Feeder

SYNTRON CO., Homer City, Penn., has made available an automatic, continuous weigh feeder that provides a steady flow of bulk materials by weight per hour to a constant, close accuracy. The machine is made up of a vibratory feeder conveyor discharging onto a constant speed belt conveyor suspended from a scale having sensitive electric valves.

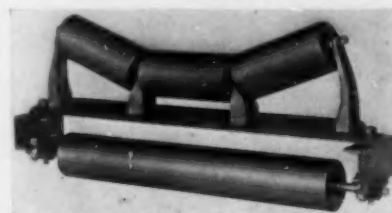


Vibratory feeder conveyor discharges on to constant speed belt conveyor suspended from a scale having sensitive electric valves which respond to variations in weight

A constant load, by weight, is maintained at all times on the constant speed belt conveyor by the ability of the vibratory feeder to speed up or slow down its discharge as controlled by the electric valves which function on the slightest under-weight or over-weight movement of the scale beam. A synchronous motor drive insures a constant belt speed.

Ball-Bearing Belt Idler

JEFFREY MANUFACTURING CO., Columbus, Ohio, has brought out a ball-bearing belt idler for carrying moderate loads of semi- and non-abrasive materials. This idler is of the conventional



Belt idler having shafts of tubing which permit lubrication from either end through pressure fittings

3-pulley, 20 deg. troughing type, made for 14, 16, 18, 20, 24, 30, and 36-in. belts. Its ball bearings are of the commercial type, with a cork seal within a pressed steel labyrinth dust cap. Pulleys are of 4-in. diameter welded steel pipe with formed steel gudgeons in the ends. Shafts are $\frac{5}{8}$ -in. seamless tubing.

Cash in on LIME
—in a DAY



• Why let break-downs of inferior pulverizing and crushing equipment knock the props from under your LIME profits. Profitable operation demands continuous operating, and you get it in a DAY. Since 1914, we have built pulverizing and crushing equipment exclusively and continuously . . . you'll find no weak points in the DAY . . . they're built up to a standard, not down to a price.

Tell us your requirements. Completely illustrated matter and detail information of capacities will be furnished you.

BROOKS EQUIPMENT & MFG. CO.
37 DAVENPORT RD. + KNOXVILLE, TENN.

DO NOT TOLERATE

DUST
IT COSTS MONEY

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DRACCO ENGINEERS
have over 20 years
experience
CONTROLLING DUST
Write Them

•
DRACCO CORPORATION
4073 E. 116th Street
CLEVELAND, OHIO

THE INDUSTRY

New Incorporations

South Milwaukee Sand and Gravel Co., South Milwaukee, Wis., has filed articles of incorporation listing as incorporators Fred Cheska, South Milwaukee; Robert Weyland, Racine, and Agnes E. Flynn, Franksville.

Pawtucket Ready-Mixed Concrete Co., Pawtucket, R. I., has been incorporated, with 250 shares of no par value common stock, by Frank A. McHale, Joseph E. McHale and Raymond J. Mahon.

Pyramid Concrete Products Co., Beaumont, Texas, has been organized by W. B. Landes, A. H. Hanna and L. I. Brents, with a capital stock of \$25,000.

Spokane Concrete Pipe Co., Spokane, Wash., T. T. Grant, has filed a trustees' certificate of final dissolution.

Piper Gravel, Inc., and Connersville Gravel Co., Inc., both of Connersville, Ind., have been dissolved.

Denton Sand Co., Inc., Queens, N. Y., has been incorporated for \$10,000; to deal in sand and gravel.

Maysville Lime and Stone Co., Maysville, Ky., has been chartered for \$50,000. Incorporators are T. A. Duke, Harriet C. Duke and Andrew C. Duke.

Glen Park Glencoe Lime Co., Wilmington, Del., has been incorporated for \$50,000 to deal in natural and other cements and lime. Incorporators are L. E. Gray, L. H. Herman and Walter Lenz.

Henderson Granite Co., Cold Springs, Okla., with capital stock of \$50,000, has been incorporated by C. S. Henderson and S. L. Henderson, Bowie, Texas, and R. M. Riddle, Oklahoma City.

Con-O-Lite of New Jersey, Bloomfield, N. J., has been chartered with \$10,000 preferred stock and \$1000 common stock. Frederic H. Pilch was the agent.

Jobe Sand Co., Forest City, N. C., has been chartered to buy, sell and produce sand and gravel, stone and other building materials with an authorized capital stock of \$3000. Incorporators are E. F. Jobe and Mrs. A. W. Jobe, Forest City, and N. A. Jobe, St. Pauls, Va.

York Insulation Co., New York, N. Y., has been incorporated with 200 shares of no par value stock to deal in asbestos.

Oolite Lime Products, Inc., Nashville, Tenn., has been chartered to mine ores and minerals and deal in mineral lands, with 10,000 shares of no par value stock. The company will maintain a branch office and quarries at Doyle, Tenn. Incorporators are Jim Taylor, S. W. Carmack and J. H. Clayton.

Metropolitan Stone Products, Inc., Bronx, N. Y., has been incorporated by F. S. Wertzner with 10 shares of no par value stock, to deal in stone products.

McHenry County Quarries, Inc., has been incorporated with 750 shares no par value common stock by C. B. Huffman, H. Maselter and C. B. O'Connor to purchase, own and operate limestone quarries in McHenry county, Illinois.

Manufacturers

The Alexander Milburn Co., Baltimore, Md., has announced the election of Walter K. Dow as vice-president. Mr. Dow has been plant superintendent of the company, and has been engaged in the development and production of welding and cutting apparatus, paint spray equipment, portable lights, etc.

American Gear Manufacturers Association, at its recent meeting held at Niagara Falls, Ont., Can., elected as president, Howard Dingle, president of The Cleveland Worm

& Gear Co., and as vice-president, Charles F. Goedke, head of the Ganschow Gear Co.

The Lincoln Electric Co., Cleveland, Ohio, has appointed J. M. Chapple as managing director of the new manufacturing subsidiary, Lincoln Electric Co., Pty., Ltd., Alexandria, Australia.

Murphy Diesel Co., Ltd., has announced the appointment of W. C. Morgan as district sales manager in the Southwest territory with headquarters at Tulsa, Okla., and William Mehler as western representative with offices at 255 10th St., San Francisco, Calif.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., recently opened its own office in Mexico City, Mexico, at Calle Gante No. 7. R. B. Rodriguez is general manager in charge of the office.

Fairbanks-Morse & Co., Chicago, Ill., has appointed A. C. Howard as general manager of the company's Beloit, Wis., plant. This position formerly was held by A. E. Ashcraft, vice-president in charge of manufacturing, in addition to his executive control of all Fairbanks-Morse factories in the United States and Canada. Mr. Howard has been assistant general manager of the Beloit plant for six years.

Babcock & Wilcox Tube Co., New York, N. Y., has announced that J. J. B. Rutherford has joined the metallurgical staff as research metallurgist. He was formerly with the research laboratory of the United States Steel Corp., Kearny, N. J.

The Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., has appointed J. B. Wittrup as manager of the Chicago mechanical rubber division.

UNIVERSAL

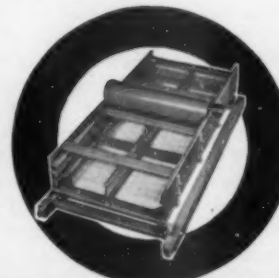
THE PERSONAL TOUCH—

Satisfying Vibrating Screen Operators has been the business of **UNIVERSAL** manufacturers for nineteen years!

They specialize in Vibrating Screens and nothing else! That's why their's is a personal understanding of the Operator and his problems.

Efficient—Rugged—Economical—That's the **UNIVERSAL**!

Write
for
Catalog
Today!



UNIVERSAL VIBRATING SCREEN CO.
RACINE, WISCONSIN

Mr. Wittrup has been connected with the company for 23 years, and will serve under John H. Merrell, vice-president of Raybestos-Manhattan, Inc., in charge of sales in the Mid-Western district.

Timken Roller Bearing Co., Canton, Ohio, has appointed David T. Marvel as manager of tube sales.

Bucyrus-Erie Co., South Milwaukee, Wis., reports that Bode-Finn Equipment Co., Inc., Cincinnati, Ohio, has been made distributor in southern Ohio to handle the sale of shovels, draglines, clamshells, and lifting cranes, ranging from $\frac{1}{4}$ - to 2-cu. yd. The new distributor will work in cooperation with the Bucyrus-Erie branch office, Clark building, Pittsburgh, Penn.

Thornton Tandem Co., Detroit, Mich., announces the removal and consolidation of the Braden avenue and McKinstry street plants into a larger factory building at 8701-79 Grinnel avenue.

The American Rolling Mill Co., Middletown, Ohio, advises that Robert H. Heyer, junior metallurgist, research laboratories, has been chosen as winner of the Charles B. Dudley Medal for 1938. This medal, which commemorates the name of the first president of the American Society for Testing Materials is awarded by the society to the author or authors of the paper at the preceding annual meeting which is of outstanding merit.

George Haiss Manufacturing Co., Inc., New York, N. Y., has appointed the Alban Tractor Co., 725-27 East 25th St., Baltimore, Md., distributor for Haiss clamshell buckets in Maryland and the District of Columbia. A complete stock of buckets and repair parts will be available in Baltimore for quick delivery.

Gar Wood Industries, Inc., Detroit, Mich., has announced that C. D. Macpherson of the hoist and body division has been appointed a member of the Board of Directors American Road Builders' Association, and also has been placed on the Executive Committee of the Manufacturers' division of the association.

Trade Literature

Power Unit.—K. R. Wilson, Buffalo, N. Y. Illustrated folder describes the KRW heavy duty, industrial unit which is built around the Ford V-8 85-hp. truck engine. Various applications of the unit are shown together with operating cost data.

Good Low Cost Roads.—Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The booklet is published to promote a better understanding of road building among tax payers, particularly in farming communities, and deals with costs, maintenance, types of roads, etc.

Engine, Internal Combustion.—Worthington Pump and Machinery Corp., Harrison, N. J. Various installations of Diesel and gas engines are illustrated and described in this 36-page booklet. Diesel engines described range from 50 to 1500 hp. at speeds from 225 to 600 r.p.m. Gas engines range in size from 30 to 1800 hp., and are designed to operate on natural, manufactured, refinery, sewage-sludge, producer or any mixture of gases.

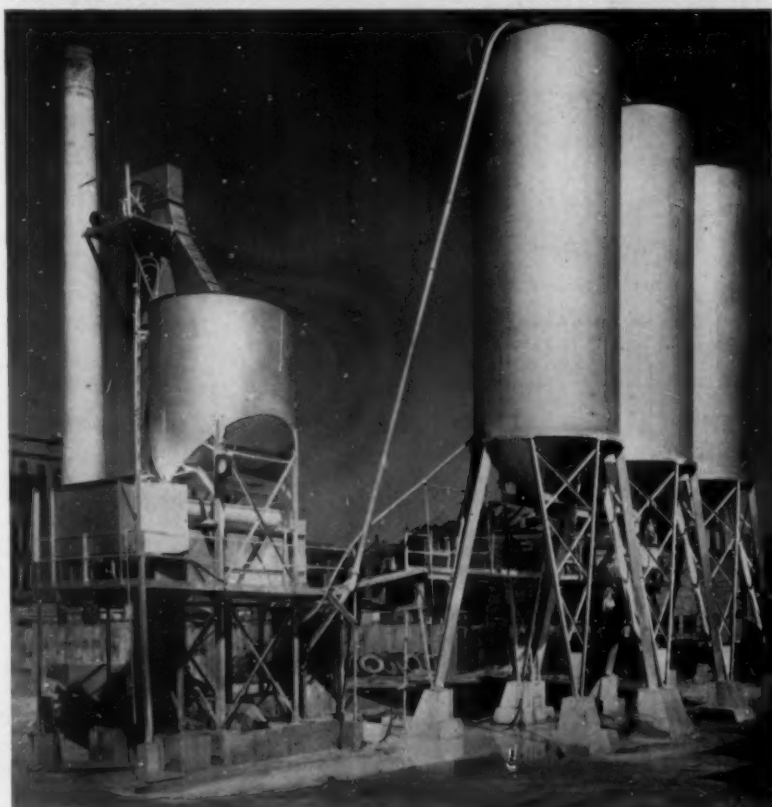
V-Belts.—The Manhattan Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. Technical details of the functions and construction of V-belts are covered in an attractive four-page bulletin describing Condon Whipcord V-belts.

Crane Control, D-C. Magnetic.—General Electric Co., Schenectady, N. Y. This 6-page, illustrated bulletin, GEA-2292A, gives information about different applications of crane control for hoist, bridge, trolley, and auxiliary motions.

Pumps, Centrifugal.—Lawrence Machine and Pump Corp., Lawrence, Mass. Bulletin 201-2 describes and illustrates the double-suction, horizontally-split type of pump.

Freight Car Mover, Manual.—Appleton-Atlas Car Mover Corp., Milwaukee, Wis. Various models and details of parts are shown in folder describing manual freight car movers.

The BROOKS-TAYLOR Lime Putty Plant



... in WASHINGTON

The Super Concrete Corporation originally installed a standard Brooks-Taylor Lime Putty Plant with two ageing tanks at its yard in Washington, D. C. The capacity was increased soon after by adding a third ageing tank as shown in the above view.

The Brooks-Taylor plant is a complete unit for producing and handling aged lime putty. The dry lime is elevated to a storage bin, slaked mechanically under thermal control, screened and pumped to ageing tanks where the excess water is removed by special filters. When the putty has reached the

proper consistency, the filters are closed and the putty is ready for delivery as required.

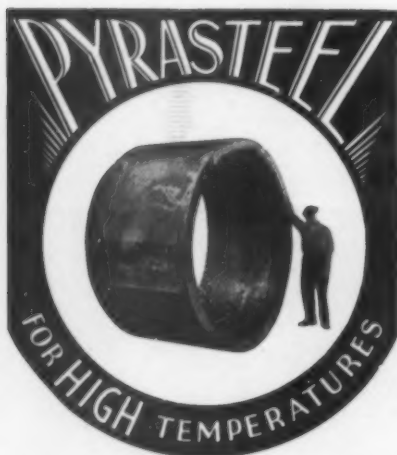
In supplying brick mortar, aged putty is withdrawn from one of the tanks into a measuring batcher, dumped into a mixer truck and mixed with sand enroute to the job. Portland cement is mixed into the sanded putty on arrival or as used by hand.

Write our nearest office listed below or to the Brooks-Taylor Company, Birmingham, Ala., for information on the Brooks-Taylor process or equipment.

CHICAGO BRIDGE & IRON COMPANY

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PA.

Chicago...2452 Old Colony Bldg.	Dallas...1487 Liberty Bank Bldg.	Philadelphia...1651-1700 Walnut St.
New York...3396-165 Broadway	Birmingham...1505 N. 50th Street	Boston...1584 Consol. Gas Bldg.
Cleveland...2265 Rockefeller Bldg.	Tulsa...1650 Hunt Bldg.	San Francisco...1093 Rialto Bldg.
Detroit...1553 LaFayette Bldg.	Houston...2919 Main Street	Los Angeles...1458 Wm. Fox Bldg.



Designed specifically for continuous service at high temperatures, PYRASTEEL is the ideal material for kiln ends.

This 7000 pound kiln end with a metal section of only $\frac{1}{8}$ " was in continuous service for six years at a temperature of 1950° F.

PYRASTEEL Kiln Ends make tight sealing possible and offer the most economical means of saving fuel.

Write for complete details.

CHICAGO STEEL FOUNDRY CO.

37th Street & Kedzie Ave.
CHICAGO, ILL.

Makers of Alloy Steel for over 25 years

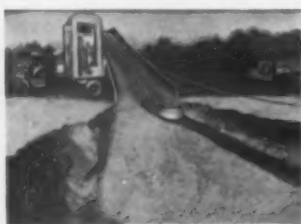


PROBLEMS of moving gravel, sand, crushed rock, etc., distances of 100 to 1500 ft. are solved most cheaply with Sauerman Drag Scraper or Slackline machines.

There is a double saving when you use a Sauerman machine. You keep down your equipment investment and your daily operating expense is lower than with any other equipment able to dig and haul an equal yardage.

SAUERMAN BROS.

430 S. CLINTON ST. CHICAGO



Cement Pavement Yardage

AWARDS of concrete pavement for May, 1938 have been announced by the Portland Cement Association as follows:

Type of construction	Sq. yds. awarded during May, 1938	Total sq. yds. for year to date May 28, 1938
Roads	4,542,513	11,789,843
Streets	686,507	3,754,399
Alleys	76,716	211,284
Total	5,305,736	15,755,526

Sand-Lime Bricks Production and Shipment

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in the various parts of the United States. They may be considered representative of the industry.

Nine active sand-lime brick plants reporting for May and eight for April statistics for which were published in June.

Average Price for May

	Plant Price	Delivered Price
Pontiac, Mich.	\$12.50	\$15.00
Watertown, Mass. ....	.....	12.50
Detroit, Mich. ....	.....	16.00
Syracuse, N. Y.	14.00	20.00 L/C 16.00 C/L
Mishawaka, Ind.	10.00	.....
Milwaukee, Wis.	10.00	12.50
Grand Rapids, Mich.	11.00	14.00

Statistics for April and May

	April†	May†
Production	1,007,228	2,370,583
Shipment (rail)	170,000	191,234
Shipment (truck)	1,191,664	2,371,752
Stock on hand	747,238	815,086
Unfilled orders	1,070,000	2,970,000

†Eight plants reporting; incomplete five not reporting unfilled orders and two not reporting stock on hand.

†Nine plants reporting; incomplete five not reporting unfilled orders and three not reporting stock on hand.

Reduces Tax Valuation

U. S. GYPSUM Co. limestone quarry holdings at Evans, Wash., were over-assessed for tax purposes in 1936 and 1937, according to a court decision recently handed down. The valuation was subsequently reduced from \$47,435 to \$14,305, the 1934 and 1935 figures, when it was disclosed that the stone in the quarry contained too much silica to be of value in the manufacture of lime. The company had brought suit against Stevens county officials.

REARDON COLOR AND CHEMICAL WORKS, Cincinnati, Ohio, is moving from 836 Reedy St. into new quarters at 2837 Stanton Ave.

May Statistics

PORTLAND CEMENT INDUSTRY in May, 1938, produced 10,361,000 bbl., shipped 9,752,000, and had in stock at the end of the month 22,871,000 according to the Bureau of Mines. Production and shipments showed decreases of 10.9 and 18.0 percent, respectively, as compared with May, 1937. Portland cement stocks at mills were 10.3 percent lower than a year ago.

The statistics here given are compiled from reports for May received by the Bureau of Mines, from all manufacturing plants.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 160 plants at the close of May, 1937 and 161 plants at the close of May, 1938.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	May 1937	1938	April 1938	Mar. 1938	Feb. 1938
The month	59.2	47.4	37.7	26.9	19.8
The 12 months ended	47.9	41.3	41.8	42.7	43.7

Favors Phosphate Exports

JOHN W. FRENCH, Bureau of Mines, Washington, D. C., has warned the Joint Congressional committee investigating phosphate resources against legislation to prohibit phosphate exports. A cost increase to domestic consumers would follow such action according to Mr. French who said that the profits of domestic phosphate producers come from exports. Exports of phosphate to foreign countries total about 1,000,000 tons annually.

Feldspar

NORTH CAROLINA feldspar producers are deeply concerned over the future of the industry because of inroads being made of nepheline syenite imported from Canada. The state has asked federal aid in limiting the imports of nepheline syenite, which is a substitute material used in making glass. Feldspar mining is a \$1,000,000 industry in western North Carolina.

VEIN MOUNTAIN PRODUCTS Co., New York, N. Y., has purchased 5300 acres of land near Thermal City, N. C., and 1000 acres at Vein Mountain, N. C., and intends to mine feldspar and mica.

OHIO public utilities commission has increased freight rates on many commodities that were excepted from the recent blanket increases. Among the commodities to feel the effect of the increases are included dolomite, gravel and limestone. Sand rates from Toledo and Cleveland are unaffected and will run about 10 cents lower than the scale.

The Belt-Breaking MARBLE SAW

—and the G.T.M.

 -Specified
GOODYEAR COMPASS
ENDLESS BELT
31' 4 1/2" long x 12" wide
for GANG SAW DRIVE
CARTHAGE MARBLE CORPORATION
Carthage, Missouri
Installed: May 1, 1933

15 H. P. Motor
Belt Speed: 2665 F. P. M.



FEW DRIVES ARE HARDER on belts than this big marble-cutting gang saw at the Missouri quarries of the Carthage Marble Corporation, world's largest producer of gray marble. Under the heavy shock load belt after belt quickly stretched and slipped, or broke. The saw was continually being shut down to repair or relace belts.

SEEKING A REMEDY the corporation called in the G.T. M.—Goodyear Technical Man. After noting the frequent overloading and the severe moisture condition due to water used in cutting, the G. T. M. specified a Goodyear COMPASS Belt made truly endless and it was applied on May 1, 1933.

AFTER 5 YEARS' SERVICE the Goodyear COMPASS is still running today. It has long outlasted any other belt on this saw, but far more important — it has never once been off the drive — never required a single repair of any kind! Slip is practically nil and the elimination of repairs has paid such big dividends that all gang saws in the quarry are now COMPASS-driven.

IN EVERY INDUSTRY similarly baffling problems are being economically solved by Goodyear rubber correctly applied by the G.T. M. The transmission of power and materials, elimination of vibration and protection of metals from corrosion are all his province. To bring him to your plant write Goodyear, Akron, Ohio, or Los Angeles, California — or the nearest Goodyear Mechanical Rubber Goods Distributor.

**BELTS
MOLDED GOODS
HOSE
PACKING**

Made by the makers of
Goodyear Tires

THE GREATEST NAME IN RUBBER

GOODYEAR

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 102

Aerial Tramways

American Cable Co.
Broderick & Bascom Rope Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.

Aggregates (Special)

Mica Crystal Co.
Tamms Silica Co.

Agitators

Allis-Chalmers Mfg. Co.
Hardinge Co., Inc.
Hetherington & Berner, Inc.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Air Compressors

Allis-Chalmers Mfg. Co.
Fuller Co.
General Electric Co.
Nordberg Mfg. Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Air Filters

Blaw-Knox Co.
Draco Corp.
Fuller Co.
Hardinge Co., Inc.

Air Separators

Blaw-Knox Co.
Combustion Engr. Corp.
Hardinge Co., Inc.
Link-Belt Co.
Raymond Pulv. Div.
Smidth, F. L., & Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

Airveyors

Fuller Co.

Alloys (Metal)

Chicago Steel Foundry Co.

Ash & Refuse Handling Equipmt.

Allen-Sherman Hoff Co.
Hais, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
Robins Conveying Belt Co.

Asphalt Heaters

Easton Car & Const. Co.

Asphalt Mixer Regulators

Hetherington & Berner, Inc.

Asphalt Mixing Plants

Hetherington & Berner, Inc.
Traylor Engineering & Mfg. Co.

Axles

Eagle Iron Works

Babbitt Metal

Allis-Chalmers Mfg. Co.
Carbonite Metal Co., Ltd.
Dixie Machy. Mfg. Co.
Ryerson, Jos. T., & Son, Inc.

Backdiggers

Bay City Shovels, Inc.
Link-Belt Co.

Backfillers

Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Link-Belt Co.
Thew Shovel Co.

Bag Cleaning Machines

Link-Belt Co.

Bagging Machines

Smidth, F. L., & Co.

Bag Ties

Wickwire-Spencer Steel Co.

Balers or Bundling Machines

(Sack)
Besser Mfg. Co.

Balls (Grinding)

Allis-Chalmers Mfg. Co.
Carnegie-Illinois Steel Corp.
(U. S. Steel Corp. Subs.)
Hardinge Co., Inc.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Barges

Chicago Bridge & Iron Co.
Eagle Iron Works

Batchers, Measuring Volume

Besser Mfg. Co.
Fuller Company
Jaeger Machine Co.

Batteries

Goodyear Tire & Rubber Co.

Battery Chargers

General Electric Co.

Bearing Metals

Allis-Chalmers Mfg. Co.

Bearings (Anti-Friction)

Eagle Iron Works
Hetherington & Berner, Inc.
Link-Belt Co.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Bearings (Ball)

Norma-Hoffman Bearings Corp.
SKF Industries, Inc.

Bearings (Roller and Tapered Roller)

Norma-Hoffman Bearings Corp.
SKF Industries, Inc.
Timken Roller Bearing Co.

Bearings (Thrust)

Norma-Hoffman Bearings Corp.
SKF Industries, Inc.
Timken Roller Bearing Co.

Belt (Elevator and Conveyor)

Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Goodyear Tire & Rubber Co.
Hais, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Thermold Rubber Co.

Belt (Metal)

Wickwire-Spencer Steel Co.

Belt (Transmission)

Bacon, Earle C., Co.
Goodyear Tire & Rubber Co.
Hais, Geo., Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.
Thermold Rubber Co.

Belt (V Type)

Allis-Chalmers Mfg. Co.
Goodyear Tire & Rubber Co.
Link-Belt Co.
Thermold Rubber Co.

Belt (Wire)

Wickwire-Spencer Steel Co.

Belt Fasteners or Hooks

Flexible Steel Lacing Co.
Robins Conveying Belt Co.

Belt Idlers

Link Belt Co.
Robins Conveying Belt Co.
Smith Engineering Wks.

Belt Lacing

Flexible Steel Lacing Co.

Belt Tighteners

Robins Conveying Belt Co.

Belt Trippers

Bacon, Earle C., Inc.
Link-Belt Co.
Robins Conveying Belt Co.

Bin Gates

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Besser Mfg. Co.
Fuller Co.
Geo. Hais Mfg. Co., Inc.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.

Bin Indicators

Fuller Co.

Bins (Storage)

Allen-Sherman-Hoff Co.
Austin-Western Road Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
(Hopper & Steel Storage)
Eagle Iron Works
Hardinge Co., Inc.
Hendrick Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Blasting Cap Crimpers

Ensign-Bickford Co.

Blasting Supplies

Ensign-Bickford Co.

Block Machines, Building

Anchor Concrete Machinery Co.
Besser Mfg. Co.
Multiplex Concrete Machy. Co.
R & L Concrete Machy. Co.

Blocks (Pillow)

Allis-Chalmers Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Blocks (Sheave)

Hais, Geo., Mfg. Co.
Link-Belt Co.
Sauerman Bros.

Blowers

Allis-Chalmers Mfg. Co.

Boats

Chicago Bridge & Iron Co.

Boats (Self-Unloading)

Link-Belt Co.
Robins Conveying Belt Co.

Boilers

Combustion Engineering Corp.

Bolts

Standard Pressed Steel Co.

Brick Machines

Besser Mfg. Co.
Multiplex Concrete Mach. Co.
R & L Concrete Machinery Co.

Buckets (Clamshell, Grab, Orange Peel, etc.)

Blaw-Knox Co.
Bucyrus-Erie Co.
Geo. Hais Mfg. Co., Inc.
Hayward Company
Jaeger Machine Co.
Link-Belt Co.
Robins Conveying Belt Co.

Buckets (Dragline and Slack-line)

Austin-Western Road Machy. Co.
Bay City Shovels, Inc.
Besser Mfg. Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Hendrick Mfg. Co.
Link-Belt Co.
Sauerman Bros., Inc.

Buckets (Dredge & Excavator)

Bucyrus-Erie Co.
Hais, Geo., Mfg. Co.
Hayward Co.

Buckets (Elevator and Conveyor)

Bacon, Earle C., Co.
Hais, Geo., Mfg. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smith Engr. Wks.

Buckets (Electric Heated, Weighing)

Easton Car & Const. Co.

Building Tile Machines

Besser Mfg. Co.
Multiplex Concrete Machy. Co.
R & L Concrete Machy. Co.

Bulldozers

Blaw-Knox Co.
Bucyrus-Erie Co.
Koehring Co.

Bullscrappers

Bucyrus-Erie Co.

Bushings

Eagle Iron Wks.
Link-Belt Co.

Cableways

American Cable Co. Inc.
Blaw-Knox Co.
Broderick & Bascom Rope Co.
(Yellow Strand)
General Electric Co.
Leschen, A., & Sons Rope Co.
Link-Belt Co.
Macwhyte Co.
Sauerman Bros.
Wickwire-Spencer Steel Co.

Calcing Equipment

Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Capstans

Link-Belt Co.
Robins Conveying Belt Co.

Cars (Block, Dump, Industrial, Etc.)

Austin-Western Road Machy. Co.
Besser Mfg. Co.
Carnegie-Illinois Steel Corp.
(U. S. Steel Corp. Subs.)
Eagle Iron Works
Easton Car & Const. Co.
Link-Belt Co.
Multiplex Concrete Mach. Co.
Traylor Engineering & Mfg. Co.

Car Couplings & Hitches

Macwhyte Co.

Car Dumps

Eagle Iron Wks.
Link-Belt Co.

Car Pullers & Movers

Link-Belt Co.
Robins Conveying Belt Co.

Car Wheels

Eagle Iron Wks.
Link-Belt Co.

GULF WINS

1ST, 2ND, 3RD AT

INDIANAPOLIS!



Winner Floyd Roberts averaged 117.2 M.P.H. in the 500-mile classic.



Wilbur Shaw averaged 115.5 M.P.H. to finish second.



Chet Miller averaged 114.9 M.P.H. to finish third.

Record-breaking drivers use GULFPRIDE OIL!

All three winners of the Indianapolis Memorial Day Race used—not special racing castor oils—but regular, stock Gulfpride . . . certified by the AAA Contest Board to be the identical oil sold by Good Gulf dealers everywhere!

Here's what the winners say about Gulfpride:

"Perfect lubrication provided by Gulfpride Oil played an important part in helping us win first, second, and third places in the 500-mile Memorial Day Race here at Indianapolis. Unfaltering performance of our engines throughout the gruelling race enabled us to attain faster average speeds than ever before had been achieved at this speedway."

{Signed} Roberts, Shaw, Miller

These three all-time record-smashing performances testify to Gulfpride's ability to stand up under punishment. That's why Roberts, Shaw, Miller and many

other prominent racing drivers choose Gulfpride over even special racing oils. The reason is that Gulfpride is the world's only 100% Pure Pennsylvania oil refined by the Alchlor process, *in addition to* conventional methods.

This same refining process is used in the preparation of Gulf's finest industrial lubricants. Thus, operators of steam turbines, air compressors, Diesel engines and many other types of industrial equipment can secure for their engines and machines the same protection against friction, wear and repair expense that Roberts, Shaw and Miller received from Gulfpride Oil when they made three all-time records . . . Gulf Oil Corp., Gulf Refining Company, Gulf Bldg., Pittsburgh, Pa.



Classified Directory—Continued

Castings

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Birdsboro Steel Foundry & Machine Co.
Blaw-Knox Co.
Buchanan, C. G., Co., Inc.
Chicago Steel Foundry Co.
Dixie Machinery Mfg. Co.
Eagle Iron Works (Grey Iron)
Hardinge Co., Inc.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Timken Roller Bearing Co.
Traylor Engineering & Mfg. Co.

Cement Plants (Contractor)

Allis-Chalmers Mfg. Co.
Hardinge Co., Inc.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Cement Colors

Mepharm, Geo. S., Corp.
Tamm's Silica Co.

Cement Process

Cement Process Corp.

Cement Pumps

Fuller Co.
Smidth, F. L., & Co.

Central Mixing Plants (Concrete)

Blaw-Knox Co.
Jaeger Machine Co.

Chain (Dredge and Steam Shovel)

Bucyrus-Erie Co.
Link-Belt Co.

Chain (Elevating and Conveying)

Bacon, Earle C., Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.

Chimney Block Machines and Molds

Besser Mfg. Co.

Chutes (Bin, Truck, Concrete, Etc.)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earl C. Bacon, Inc.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hardinge Co., Inc.
Hendrick Mfg. Co.
Jaeger Machine Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Chute Liners

Bacon, Earle C., Inc.
Goodyear Tire & Rubber Co., Inc.
Haiss, Geo., Mfg. Co.
Hendrick Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Circuit Breakers

Allis-Chalmers Mfg. Co.
General Electric Co.

Circuit Testers

General Electric Co.

Clarifiers

Hardinge Co., Inc.
Link-Belt Co.

Classifiers

Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Eagle Iron Works
Hardinge Co., Inc.
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
Nordberg Manufacturing Co.
Raymond Pulverizer Division

Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.
Universal Vibr. Screen Co.
Williams Patent Crusher & Pulv. Co.

Clutches

Allis-Chalmers Mfg. Co.
Link-Belt Co.

Coal Pulverizing Equipment

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Combustion Engr. Corp.
Hardinge Co., Inc.
Link-Belt Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Concrete Mixers

Anchor Concrete Machy. Co.
Besser Mfg. Co.
Blaw-Knox Co.
Jaeger Machine Co.
Koehring Co.
Multiplex Concrete Machy. Co.

Concrete Paints & Coatings

Tamm's Silica Co.

Concrete Waterproofing & Dampproofing

Tamm's Silica Co.

Controllers (Electric)

Allis-Chalmers Mfg. Co.
General Electric Co.

Converters (Electric)

Allis-Chalmers Mfg. Co.
General Electric Co.

Conveyors (Apron)

Allis-Chalmers Mfg. Co.
Barber-Greene Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engr. & Mfg. Co.
Wickwire-Spencer Steel Co.

Conveyors (Belt)

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earle C. Bacon
Barber-Greene Co.
Besser Mfg. Co.
Dracco Corp.
Fuller Company
Geo. Haiss Mfg. Co., Inc.
Hendrick Mfg. Co.
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
New Holland Machine Co.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Conveyors (Hydro Vacuum)

Allen-Sherman Hoff Co.

Conveyors (Pan)

Allis-Chalmers Mfg. Co.
Link-Belt Co.

Conveyors (Pneumatic)

Dracco Corp.
Fuller Company
Raymond Pulverizer Division

Conveyors (Screw)

Besser Mfg. Co.
Eagle Iron Works
Hardinge Co., Inc.
Link-Belt Co.

Conveyors (Trolley)

Link-Belt Co.

Conveyors (Vibrating)

Allis-Chalmers Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.

Conveyor Idlers & Rolls

Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Barber-Greene Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Smidth, F. L., & Co.

Coolers

Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co., Inc.
Link-Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Correcting Basins

F. L. Smidth & Co.

Couplings (Flexible and Shaft)

Allis-Chalmers Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Standard Pressed Steel Co.

Cranes (Diesel Electric Steam, Etc.)

Austin-Western Road Machy. Co.
Bay City Shovels, Inc.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Cranes (Tractor)

Austin-Western Road Machy. Co.
Bay City Shovels, Inc.
Bucyrus-Erie Co.
Koehring Co.
Lima Locomotive Wks., Inc. (Shovel & Crane Div.)
Link-Belt Co.

Cranes (Truck)

Bay City Shovels, Inc.
Thew Shovel Co.

Crawler Attachments

Allis-Chalmers Mfg. Co.
Bay City Shovels, Inc.
Link-Belt Co.

Crawling Tractor Excavators

Austin-Western Road Machy. Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Crusher Parts

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Bacon, Earle C., Co.
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co., Inc.
Dixie Machinery Mfg. Co.
Eagle Iron Works
McLanahan & Stone Corp.
Pennsylvania Crusher Co.
Traylor Engr. & Mfg. Co.

Crushers (Hammer)

Allis-Chalmers Mfg. Co.
American Pulv. Co.
Austin-Western Road Machy. Co.
Brooks Equipment & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subs.)
Dixie Machinery Mfg. Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Jaw and Gyratory)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earle C. Bacon, Inc.
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co., Inc.
Dixie Machinery Mfg. Co.
Hardinge Co., Inc.
Lewistown Fdry. & Mach. Co. (Jaw)
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
Pennsylvania Crusher Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Laboratory)

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Bacon, Earle C., Co.
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co., Inc.
Dixie Machinery Mfg. Co.

Hardinge Co., Inc.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Primary Breakers)

Allis-Chalmers Mfg. Co.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushers (Reduction)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Inc.
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co., Inc.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.

Crushers (Ring)

American Pulverizer Co.
Dixie Machinery Mfg. Co.
Hardinge Co., Inc.
Williams Patent Crusher & Pulv. Co.

Crushers (Roll)

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Birdsboro Steel Foundry & Machine Co.
Besser Mfg. Co.
Brooks Equipment & Mfg. Co.
Buchanan, C. G., Co., Inc.
Eagle Iron Works
Hardinge Co., Inc.
Link-Belt Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Pennsylvania Crusher Co.
Robins Conveying Belt Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Crushing and Screening Plants (Portable)

Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Birdsboro Steel Foundry & Machine Co.
Blaw-Knox Co.
Buchanan, C. G., Co., Inc.
Dixie Machinery Mfg. Co.
Eagle Iron Works
Link-Belt Co.
Pennsylvania Crusher Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.

Curing Racks

Besser Mfg. Co.
Multiplex Concrete Machy. Co.

Dedusters

Blaw-Knox Co.

Derricks

Hayward Company

Detonators

Ensign-Bickford Co.

Dewatering Machines

Allis-Chalmers Mfg. Co.
Eagle Iron Works
Hardinge Co., Inc.
Jaeger Machine Co.
Link-Belt Co.
Morris Machine Works

Diaphragms (Rubber)

Jaeger Machine Co.

Dippers & Teeth (Dredge & Shovel)

Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co., Inc.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.



From scalping to finished sizing All Productive "Selectros"



"Selectro"—the sensational Vibrating Screen that is repeatedly proving its ability to pay for itself by actually producing greatest recovery at lowest operating costs.

Three PRODUCTIVE "Selectros" do practically all the sizing of crushed as well as uncrushed gravel at the new Middletown Sand and Gravel Company plant. The result is a very close split and a number of products all of which are salable.

Every "Selectro" contains these essential features—variable vibration . . . quick tilting . . . fast, easy cloth changes . . . full floating, soft shoe mounting . . . large capacity . . . accurate grading . . . wet, damp or dry materials . . . small space . . . noiseless and sturdy. Will maintain 100% recovery when screening as fine as 40 mesh on products varying by less than one thousandth of an inch.

Let us show you how the "Selectro" will solve your screening problems.

PRODUCTIVE EQUIPMENT CORP.
4600 SOUTH KEDZIE AVE. CHICAGO, ILL.

SCREENS

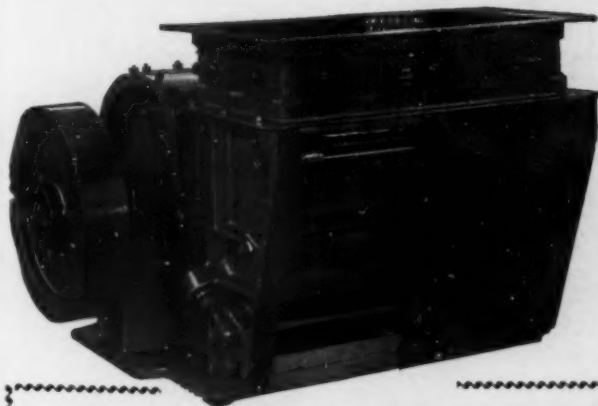
for
STONE-GRAVEL
SAND and
Other Material

PERFORATIONS
of all sizes and
shapes.
H & K Screens
are made with
care to give service
to the user.
Try our screens on your vibrator

ANY METAL • ANY PERFORATION

The Harrington & King Co.
PERFORATING

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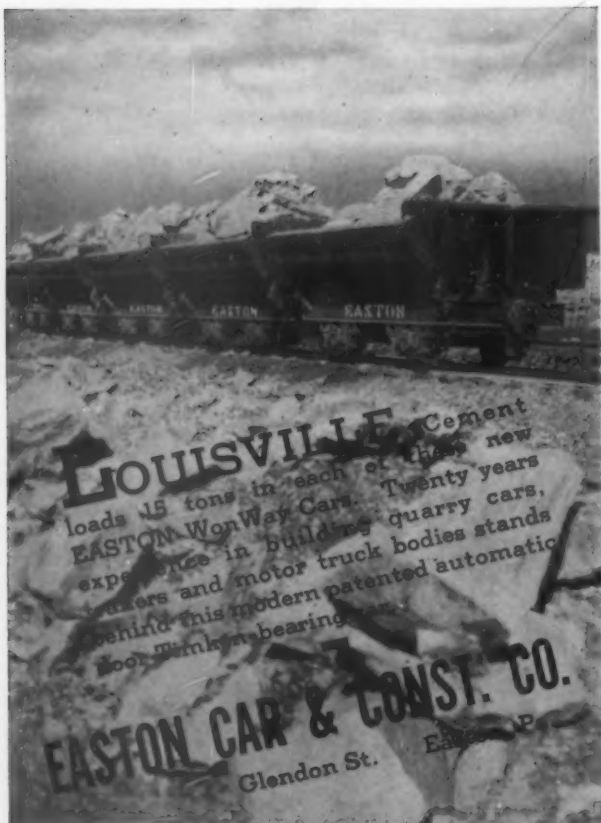
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Cash in on the Federal Government's compliance payments to farmers for liming their fields. Volume business NOW and for years to come!

This powerful AMERICAN crushing unit will produce greater tonnage of uniform products at lower cost. Designed to give years of trouble-free service.

There is an AMERICAN for every crushing and pulverizing need. Write today for complete details.

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HYDROSEAL

MAXIMIX RUBBER PROTECTION

DREDGE PUMPS

See our advertisement
on Inside Front Cover
of Last Month's Issue

The ALLEN-SHERMAN-HOFF CO.
221 S. 15th Street Philadelphia

SYMONS

CRUSHERS • SCREENS

**FINER PRODUCT
GREATER CAPACITY
LOWER CRUSHING COST**

These advantages
have made Symons
Cones first among
reduction crushers.

**SIZES CLOSER
SAVES HEADROOM
ACTION IS POSITIVE**

The trend is def-
initely toward level
screening. Again
Symons leads the way!

NORDBERG MFG. CO., MILWAUKEE WISCONSIN

Classified Directory—Continued

Disintegrators
Smidth, F. L., & Co.

Ditchers
Barber-Greene Co.
Bucyrus-Erie Co.

Dredge Cableway Excavators
American Cable Co.
Austin-Western Road Machy.
Co.
Bay City Shovels, Inc.
Blaw-Knox Co.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Sauerman Bros., Inc.
Thew Shovel Co.
Wickwire-Spencer Steel Co.

Dredges
Bay City Shovels, Inc.
Birdsboro Steel Foundry &
Machine Co.
Buchanan, C. G., Co., Inc.
Bucyrus-Erie Co.
Eagle Iron Works
Hayward Co.
Hetherington & Berner, Inc.
(Complete Steel)
Link-Belt Co.
Morris Machine Works

Dredge Cutter Heads & Ladders
Birdsboro Steel Foundry &
Machine Co.
Buchanan, C. G., Co., Inc.
Eagle Iron Wks.
Hetherington & Berner, Inc.

Dredge Hulls
Chicago Bridge & Iron Co.
Eagle Iron Wks.

Dredging Sleeves
Hetherington & Berner, Inc.
Thermold Rubber Co.

Drills (Blast Hole)
Bucyrus-Erie Co.

Drills (Rock)
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drills (Well)
Bucyrus-Erie Co.

Drill Bits
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drill Sharpening Machines
Bucyrus-Erie Co.

Drilling Accessories
Bucyrus-Erie Co.
Timken Roller Bearing Co.

Drives (Belt, Chain and Rope)
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Short Center)
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Worm)
Link-Belt Co.

Dryers
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Combustion Engineering Corp.
Hardinge Co., Inc.
Hetherington & Berner, Inc.
Lewistown Foundry & Mach.
Co.
Link-Belt Co.
McLanahan & Stone Corp.
Raymond Pulverizer Division
Smidth, F. L., & Co.
Traylor Engineering & Mfg.
Co.
Tyler, W. S., Co.
Williams Patent Crusher &
Pulv. Co.

Dust Collecting Systems
Allen Sherman Hoff Co.
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Dracoo Corp.
Hendrick Mfg. Co.
Raymond Pulverizer Division
Smidth, F. L., & Co.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
Blaw-Knox Co.
Dracoo Corp.
Fuller Company

Dust Collector Bags
Blaw-Knox Co.

Electric Motors
Allis-Chalmers Mfg. Co.
General Electric Co.

Electric Motor Starters
Allis-Chalmers Mfg. Co.
General Electric Co.

Elevators
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy.
Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Barrett-Cravens Co.
Besser Mfg. Co.
Dracoo Corp.
Eagle Iron Works
Fuller Company
Hais, Geo., Mfg. Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Lewistown Foundry & Mach.
Co.
Link-Belt Co.
McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
New Holland Machine Co.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg.
Co.
Williams Patent Crusher &
Pulv. Co.

Engines
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Birdsboro Steel Foundry &
Machine Co.
Buchanan, C. G., Co., Inc.
Blaw-Knox Co.
Fuller Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Morris Machine Works
Productive Equipment Corp.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg.
Co.
Williams Patent Crusher &
Pulv. Co.

**Engines (Diesel, Gasoline, Kero-
sene and Oil)**
Allis-Chalmers Mfg. Co.
New Holland Machine Co.
Nordberg Mfg. Co.

Engines (Natural Gas)
Allis-Chalmers Mfg. Co.

Engines (Steam)
Allis-Chalmers Mfg. Co.
Morris Machine Works
Nordberg Mfg. Co.

Exhauster
Combustion Engineering Co.
Raymond Pulverizer Division

Fans (Exhaust & Ventilating)
American Blower Corp.
Blaw-Knox Co.
General Electric Co.
Smidth, F. L., & Co.

Feeders
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Barber-Greene Co.
Besser Mfg. Co.
Blaw-Knox Co.
Fuller Co.
Hardinge Co., Inc.
Hetherington & Berner, Inc.
Link-Belt Co.
Pennsylvania Crusher Co.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Smith Engr. Wks.
Traylor Engineering & Mfg.
Co.

Filter Cloth
Tyler, W. S., Co.
Wickwire-Spencer Steel Co.

Classified Directory—Continued

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman Hoff Co.

Forgings
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.

Fuels (Diesel)
Texas Co.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Fuses (Electric)
General Electric Co.

Fuse Cutters
Ensign-Bickford Co.

Fuse Lighters
Ensign-Bickford Co.

Galvanometers
General Electric Co.

Gasoline
Gulf Refining Co.
Texas Company

Gears
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co., Inc.
General Electric Co.
Hais, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Generators & Motor Generator Sets
Allis-Chalmers Mfg. Co.
General Electric Co.
Nordberg Mfg. Co.

Glass Sand Equipment
Lewistown Pdry. & Mach. Co.

Grapples
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Co.

Grease
Bacon, Earle C., Co.
Gulf Refining Co.
Texas Company

Grease Cups
Link-Belt Co.
Robins Conveying Belt Co.

Guards (Lamp)
Flexible Steel Lacing Co.

Guards (Machinery)
Harrington & King Perforating Co.
Tyler, W. S., Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Morris Machine Works

Gypsum Plants
Traylor Engr. & Mfg. Co.

Haulage Systems (Electric)
General Electric Co.

Haulage Systems (Remote Control)
General Electric Co.

Heaters (Bitumen)
Easton Car & Const. Co.

Hoists (Chain, Electric, Portable, Skip, Etc.)
Allis-Chalmers Mfg. Co.
Besser Mfg. Co.
Commercial Shearing & Stamping Co.

Iron Works
Hetherington & Berner, Inc.
Jaeger Machine Co.

Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.

Robins Conveying Belt Co.
Sauerman Bros., Inc.
Smith Engr. Wks.

Traylor Engineering & Mfg. Co.

Hoppers
Austin-Western Road Machy Co.

Besser Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.

Hardinge Co.
Hendrick Mfg. Co.
Jaeger Machine Co.

Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Hose (Water, Steam, Air Drill, Pneumatic, Sand Suction and Discharge)

Dixie Machinery Mfg. Co.
Goodyear Tire & Rubber Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Works
Thermoid Rubber Co.

Hydrators (Lime)
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.
Traylor Engr. & Mfg. Co.

Jigs (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Hardinge Co.
Traylor Engineering & Mfg. Co.

Joist & Slab Machines (Concrete)
R & L Concrete Machy. Co.

Kilns Parts
Allis-Chalmers Mfg. Co.
Birdsboro Steel Foundry & Machine Co.

Blaw-Knox Co.
Buchanan, C. G., Co.
Chicago Steel Foundry Co.
Hardinge Co.
Smith, F. L., & Co.
Traylor Engineering & Mfg. Co.

Kilns (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.
F. L. Smith & Co.
Traylor Engineering & Mfg. Co.

Kilns (Shaft)
Hardinge Co.

Kilns (Vertical)
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.

Kiln Burners
Smith, F. L., & Co.

Kiln Chain Systems
Smith, F. L., & Co.

Kiln Liners (Metal)
Hardinge Co.
Traylor Engr. & Mfg. Co.

Kominuters
Smith, F. L., & Co.

Laboratory Apparatus
Smith, F. L., & Co.

Lift Trucks
Barrett-Cravens Co.
Besser Mfg. Co.

Lime Handling Equipment
Chicago Bridge & Iron Co.
Fuller Co.
Hardinge Co.
Link-Belt Co.
Raymond Pulv. Div.
Robins Conveying Belt Co.

Lime Plants
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.
Smith, F. L., & Co.
Traylor Engineering & Mfg. Co.

Lime Putty Plants
Chicago Bridge & Iron Co.

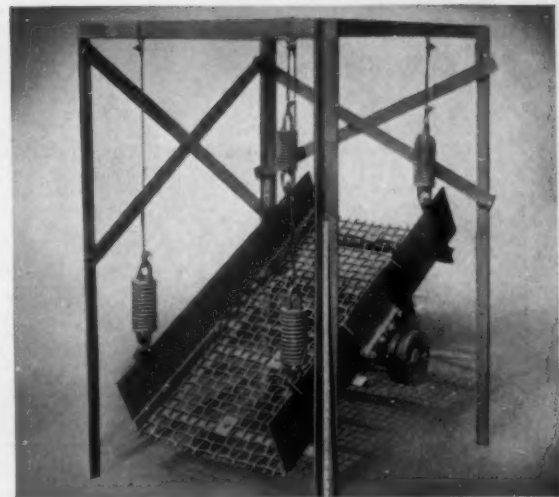
Loaders (Bin, Car, Hopper, Truck, Etc.)

Barber-Greene Co.
Besser Mfg. Co.
Bucyrus-Erie Co.
Fuller Company
Geo. Hais, Mfg. Co., Inc.
Link-Belt Co.
New Holland Machine Co.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.

Loaders (Boat)
Link-Belt Co.

Loaders (Box Car)
Barber-Greene Co.
Link-Belt Co.

Loaders (Underground)
Allis-Chalmers Mfg. Co.
Bay City Shovels, Inc.
Nordberg Mfg. Co.
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Lima Locomotive Wks., Inc.
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- Locomotives (Electric, Trolley & Storage Battery)**
General Electric Co.
Lima Locomotive Wks., Inc.
(Loco. Div.)
- Locomotives (Gasoline and Gas-Electric)**
General Electric Co.
- Locomotives (Kerosene)**
Lima Locomotive Wks., Inc.
(Loco. Div.)
- Locomotives (Oil & Oil-Electric)**
General Electric Co.
Lima Locomotive Wks., Inc.
(Loco. Div.)
- Locomotives (Steam)**
Lima Locomotive Wks., Inc.
(Loco. Div.)
- Locomotive Stack Netting**
Tyler, W. S., Co.
- Lubricants**
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
Texas Co.
- Magnetic Separators**
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co.
- Magnets**
General Electric Co.
- Manganese Steel Parts**
Bacon, Earle C., Inc.
- Material Handling Equipment**
Allen-Sherman-Hoff Co.
Austin-Western Road Machy. Co.
Barber-Greene Co.
Fuller Company
Hardinge Co.
Link-Belt Co.
Raymond Pulverizer Division
Robins Conveying Belt Co.
- Measuring Devices**
Blaw-Knox Co.
General Electric Co.
Hardinge Co.
Jaeger Machine Co.
- Mechanical Rubber Goods**
Thermoid Rubber Co.
- Mill Parts**
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Hardinge Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.
- Mills, Grinding (Ball, Tube, Hammer, Rod, Roll, Etc.) (See also Pulverizers)**
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Birdsboro Steel Foundry & Machine Co.
Brooks Equipment & Mfg. Co.
Buchanan, C. G., Co.
Dixie Machinery Mfg. Co.
Hardinge Co.
Lewistown Foundry & Mach. Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.
Williams Patent Crusher & Pulv. Co.
- Mill Liners**
Allis-Chalmers Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsl.)
Hardinge Co.
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.
- Mortar Colors**
Mepharm, Geo. S., Corp.
Tamms Silica Co.
- Mortar Mixers**
Eagle Iron Works
Jaeger Machine Co.
- Nozzles (Gravel Washing)**
Link-Belt Co.
- Nuts**
Standard Pressed Steel Co.
- Oils (Lubricating)**
Bacon, Earle C., Inc.
Gulf Refining Co.
Robins Conveying Belt Co.
The Texas Co.
- Oils (Cutting)**
The Texas Co.
- Ornamental Forms (Concrete)**
Besser Mfg. Co.
- Packings**
Goodyear Tire & Rubber Co.
Thermoid Rubber Co.
- Pallets**
Anchor Concrete Machinery Co.
Bacon, Earle C., Inc.
Besser Mfg. Co.
Commercial Shearing and Stamping Co.
Multiplex Concrete Machy Co.
- Pans, Grinding (Wet & Dry)**
Eagle Iron Works
Traylor Engineering & Mfg. Co.
- Perforated Metal**
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Chicago Perforating Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Joseph T. Ryerson & Son, Inc.
Traylor Engr. & Mfg. Co.
Wickwire-Spencer Steel Co.
- Perforated Screen Plates & Cloth—See Screen Cloth & Plates**
- Pinions**
Bacon, Earle C., Inc.
General Electric Co.
Hais, Geo., Mfg. Co.
Link-Belt Co.
- Pipe Molds and Machines (Concrete)**
Besser Mfg. Co.
R & L Concrete Machinery Co.
- Pipe**
Chicago Bridge & Iron Co.
Hetherington & Berner, Inc.
Morris Machine Works
- Pipe Fittings**
Hetherington & Berner, Inc.
- Plaster Colors**
Mepharm, Geo. S., Corp.
- Pontoons**
Chicago Bridge & Iron Co.
Eagle Iron Works
Morris Machine Works
- Power Transmission Machinery**
Allis-Chalmers Mfg. Co.
Link-Belt Co.
SKF Industries, Inc.
Standard Pressed Steel Co.
Tinklen Roller Bearing Co.
- Pulleys**
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Birdsboro Steel Foundry & Machine Co.
Buchanan, C. G., Co.
Link-Belt Co.
Robins Conveying Belt Co.
- Pulverizer Parts**
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Dixie Machinery Mfg. Co.
Hardinge Co.
Smidth, F. L., & Co.
- Pulverizers (Hammer, Ring, Rod & Roll) (See Also Mills & Crushers)**
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Austin-Western Road Machy. Co.
Birdsboro Steel Foundry & Machine Co.
Blaw-Knox Co.
Brooks Equipment & Mfg. Co.
Buchanan, C. G., Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsl.)
Combustion Engr. Corp.
Dixie Machy. Mfg. Co.
Hardinge Co.

Classified Directory—Continued

Lewistown Foundry & Mach.

Co.
New Holland Machine Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg.
Co.
Williams Patent Crusher &
Pulv. Co.

Pumps (Diaphragm)

Hardinge Co.
Jaeger Machine Co.

Pumps (Dredge)

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Birdsboro Steel Foundry &
Machine Co.
Buchanan, C. G., Co.
Bucyrus-Erie Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Wks.

Pumps (Dry Pulverized Material)

Fuller Company
Morris Machine Works
Smidth, F. L., & Co.

Pumps (Slurry)

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Hardinge Co.
Morris Machine Wks.
Smidth, F. L., & Co.
Wilfley, A. R., & Sons, Inc.

Pumps Valves (Slurry)

Fuller Co.
Wilfley, A. R., & Son, Inc.

Pumps (Vacuum)

Allis-Chalmers Mfg. Co.
Fuller Company
Smidth, F. L., & Co.

Pump Valves (Dry Pulverized Material)

Fuller Co.

Pumps (Water)

Allis-Chalmers Mfg. Co.
Jaeger Machine Co.
Morris Machine Wks.

Railways (Electric)

General Electric Co.

Rectifiers

Allis-Chalmers Mfg. Co.
General Electric Co.

Recuperators

Traylor Engineering & Mfg.
Co.

Refractories

Smidth, F. L., & Co.

Regulators (Voltage)

Allis-Chalmers Mfg. Co.
General Electric Co.

Rewashers (Screw)

Link-Belt Co.
Smith Engineering Works

Roofing

Ryerson, Jos. T., & Son, Inc.
Texas Co.

Rope (Transmission)

Allis-Chalmers Mfg. Co.

Sand Drags

Eagle Iron Wks.
Link-Belt Co.
Smith Engr. Wks.

Sand and Gravel Plants

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy
Co.
Bacon, Earle C., Co.
Eagle Iron Works
Hardinge Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg.
Co.

Sand Lime Brick Machinery

Hardinge Co.

Sand Separators

Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Wks.

Sand Settling Tanks

Chicago Bridge & Iron Co.
Eagle Iron Wks.
Hendrick Mfg. Co.
Link-Belt Co.
Nordberg Mfg. Co.
Smith Engr. Wks.

Scales (Conveyor)

Merrick Scale Co.

Scales (Hopper)

Blaw-Knox Co.
Merrick Scale Co.

Scales (Truck & Track)

Hardinge Co.
Merrick Scale Co.

Scrapers (Power Drag)

Austin-Western Road Machy
Co.
Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Link-Belt Co.
Sauerman Bros., Inc.

Screen Cloth & Plates (Perforated)

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Chicago Perforating Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.
Traylor Engineering & Mfg.
Co.
Wickwire-Spencer Steel Co.

Screen Parts

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Hardinge Co.
Hendrick Mfg. Co.
Traylor Engineering & Mfg.
Co.
Wickwire-Spencer Steel Co.

Screens (Grizzly)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy
Co.
Eagle Iron Works
Hendrick Mfg. Co.
Lewistown Foundry & Mach
Co.
Link-Belt Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smith Engineering Works
Traylor Engineering & Mfg.
Co.
Tyler, W. S., Co.
Universal Vibrating Screen
Co.

Screens (Laboratory)

Allis-Chalmers Mfg. Co.
Hardinge Co.
Hendrick Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.
Tyler, W. S., Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher &
Pulv. Co.

Screens (Revolving)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy
Co.
Bacon, Earle C., Inc.
Eagle Iron Wks.
Hales, Geo., Mfg. Co., Inc.
Hardinge Co.
Link-Belt Co.
Robins Conveying Belt Co.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.

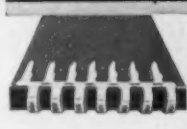
Screens, Scalping

Allis-Chalmers Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Works
Williams Patent Crusher &
Pulv. Co.

Screens (Trommel)

Traylor Engr. & Mfg. Co.

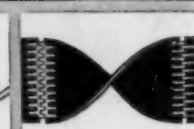
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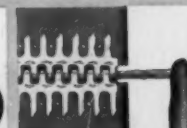
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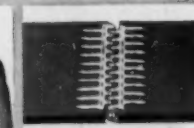
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Great strength.
Long life.



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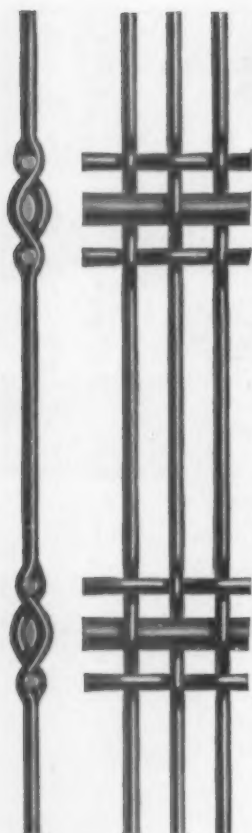
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Classified Directory—Continued

Screens (Vibrating)

Allis-Chalmers Mfg. Co.
Austin-Western Road Machy.
Co.
Bacon, Earle C., Co.
Eagle Iron Works
Hardinge Co.
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
Robins Conveying Belt Co.
Smith Engineering Works
Sturtevant Mill Co.
W. S. Tyler Co.
Universal Vib. Screen Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Screws (Cap, Self Locking, Set, Hollow Set)
Standard Pressed Steel Co.

Seal Rings

Traylor Engineering & Mfg. Co.

Semi-Trailers, Quarry (Side & End Dumping)
Easton Car & Const. Co.

Shafting

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Link-Belt Co.

Shale Planers

Eagle Iron Wks.

Sheaves

Allis-Chalmers Mfg. Co.
Eagle Iron Works
Haiss, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Link-Belt Co.
McLanahan & Stone Corp.
Sauerman Bros.

Shovels (Compressed Air)

Nordberg Mfg. Co.

Shovels, Power (Diesel, Diesel-Air, Electric, Gasoline, Gas-Electric, Oil & Steam)

Austin-Western Road Machy.
Co.
Bay City Shovels, Inc.
Bucyrus-Erie Co.
Koehring Co.
Link-Belt Co.
Thew Shovel Co.

Shovels (Tractor)

Austin-Western Road Machy.
Co.
Bay City Shovels, Inc.
Koehring Co.
Link-Belt Co.

Shovels (Truck)

Bay City Shovels, Inc.
Thew Shovel Co.

Shovels (Underground)

Allis-Chalmers Mfg. Co.
Bay City Shovels, Inc.
Nordberg Mfg. Co.
Thew Shovel Co.

Shredders

Williams Patent Crusher & Pulv. Co.

Sieves (Testing)

Hendrick Mfg. Co.
Smidth, F. L., & Co.
Tyler, W. S., Co.

Silos

Blaw-Knox Co.
Chicago Bridge & Iron Co.
F. L. Smidth & Co.

Silo Stave Machines (Concrete)

Besser Mfg. Co.

Skids

Besser Mfg. Co.
Easton Car & Const. Co.

Slakers (Rotary)

Traylor Engineering & Mfg. Co.

Slugs (Grinding)

Smidth, F. L., & Co.

Slurry Mixers

Hardinge Co.
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Slurry Separators

Smidth, F. L., & Co.

Slurry Thickeners

Hardinge Co.
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.

Smokestacks

Chicago Bridge & Iron Co.
Hendrick Mfg. Co.
Traylor Engineering & Mfg. Co.

Speed Reducers

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Link-Belt Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Spouts

Link-Belt Co.
Traylor Engineering & Mfg. Co.

Sprockets

Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bacon, Earle C., Co.
Link-Belt Co.

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Ross Screen & Feeder Co.

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Timken Roller Bearing Co.

Steel (Open Hearth)

American Manganese Steel Co.
Timken Roller Bearing Co.

Steel (Special Alloy)

Chicago Steel Foundry Co.
Timken Roller Bearing Co.

Stokers

Combustion Engineering Corp.
Link-Belt Co.

Storage Equipment

Barber-Greene Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Haiss, Geo., Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Stucco Colors

Mepharm, Geo. S., Corp.

Switchboards

Allis-Chalmers Mfg. Co.
General Electric Co.

Tachometers

General Electric Co.

Tampers (Power & Hand)

Besser Mfg. Co.
Multiplex Concrete Machy Co.

Tanks

Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Combustion Engineering Corp.
Eagle Iron Works
Hardinge Co.
Hendrick Mfg. Co.
Link-Belt Co.
Raymond Pulverizer Division
Traylor Engineering & Mfg. Co.

Towers

Blaw-Knox Co.
Eagle Iron Works
Hendrick Mfg. Co.
Jaeger Machine Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Track & Track Equipment

Besser Mfg. Co.
Carnegie-Illinois Steel Corp.
(U. S. Steel Corp. Subs.)
Nordberg Mfg. Co.

Track Shifters

Nordberg Mfg. Co.

Track Systems (Overhead)

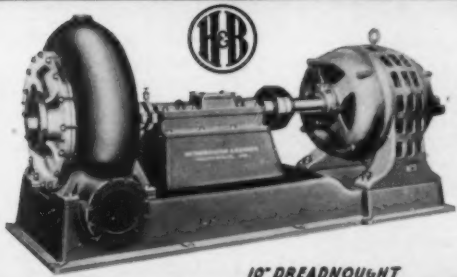
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Vibrating **SCREENS**



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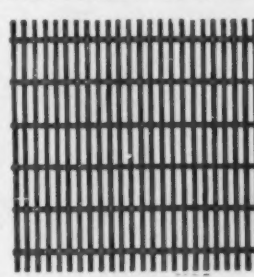
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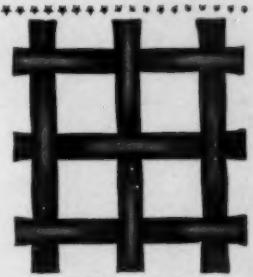
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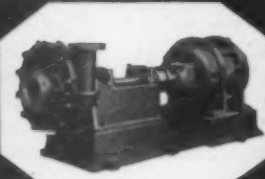
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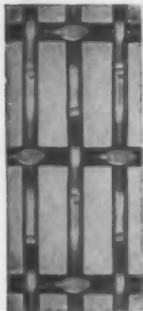


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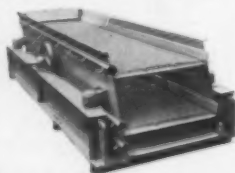
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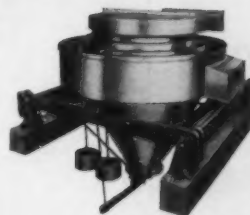
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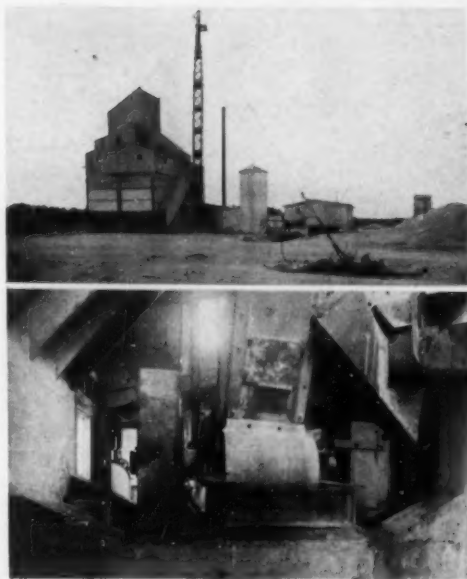
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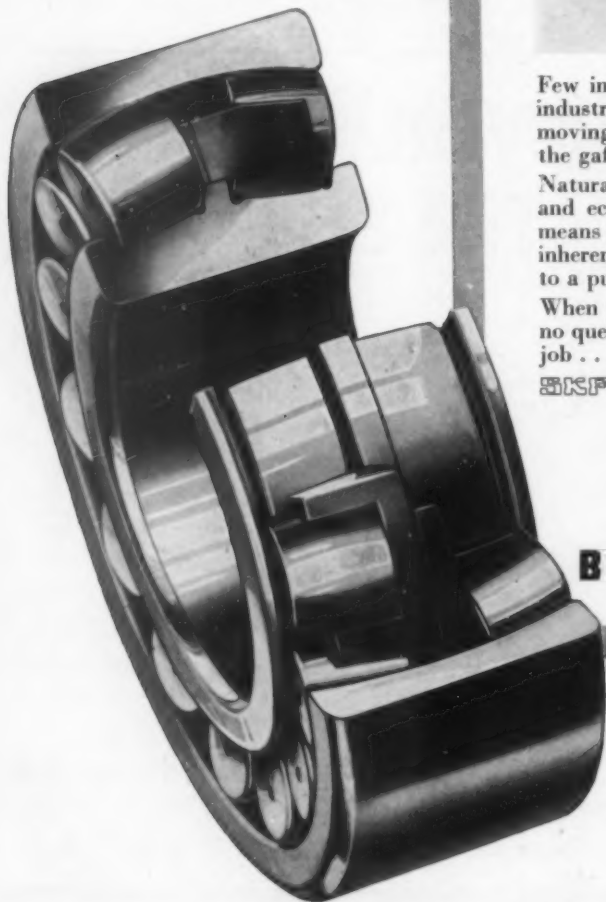
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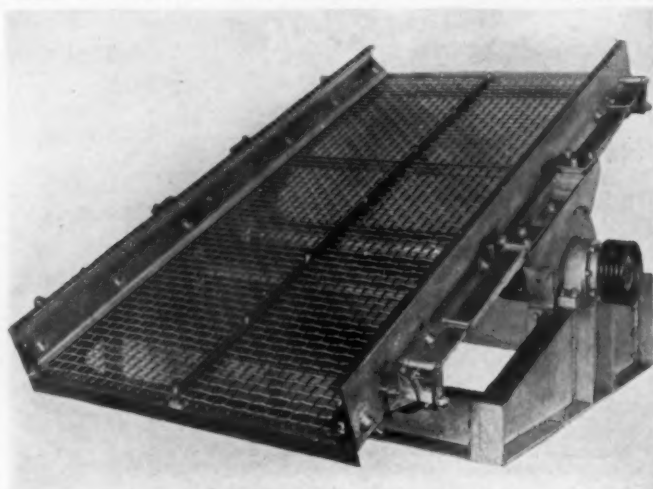
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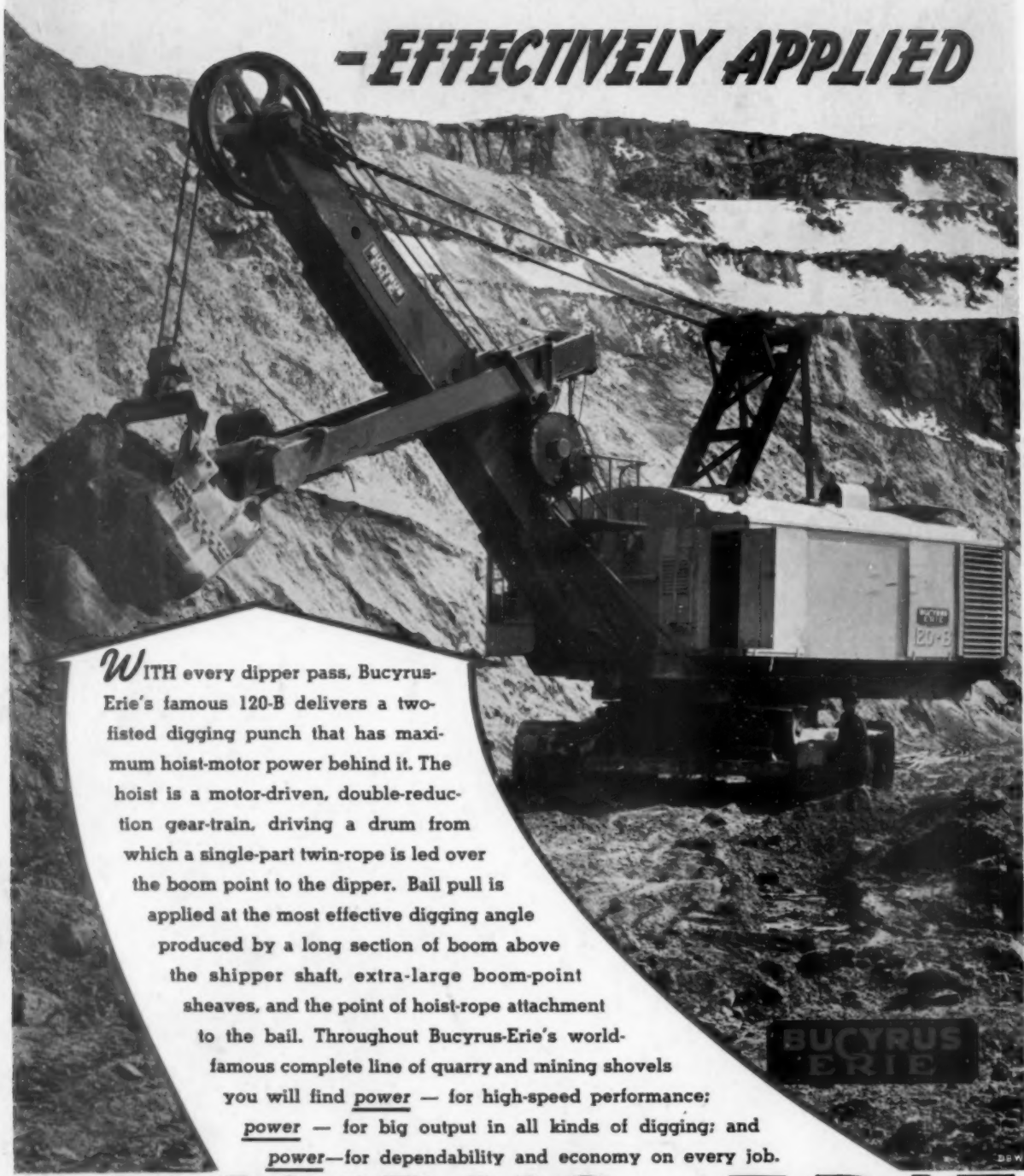
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DIGGING POWER

-EFFECTIVELY APPLIED



WITH every dipper pass, Bucyrus-Erie's famous 120-B delivers a two-fisted digging punch that has maximum hoist-motor power behind it. The hoist is a motor-driven, double-reduction gear-train, driving a drum from which a single-part twin-rope is led over the boom point to the dipper. Bail pull is applied at the most effective digging angle produced by a long section of boom above the shipper shaft, extra-large boom-point sheaves, and the point of hoist-rope attachment to the bail. Throughout Bucyrus-Erie's world-famous complete line of quarry and mining shovels you will find power — for high-speed performance; power — for big output in all kinds of digging; and power—for dependability and economy on every job.

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SOUTH MILWAUKEE, WISCONSIN, U.S.A.